AUGUST, 1955

American Engineer

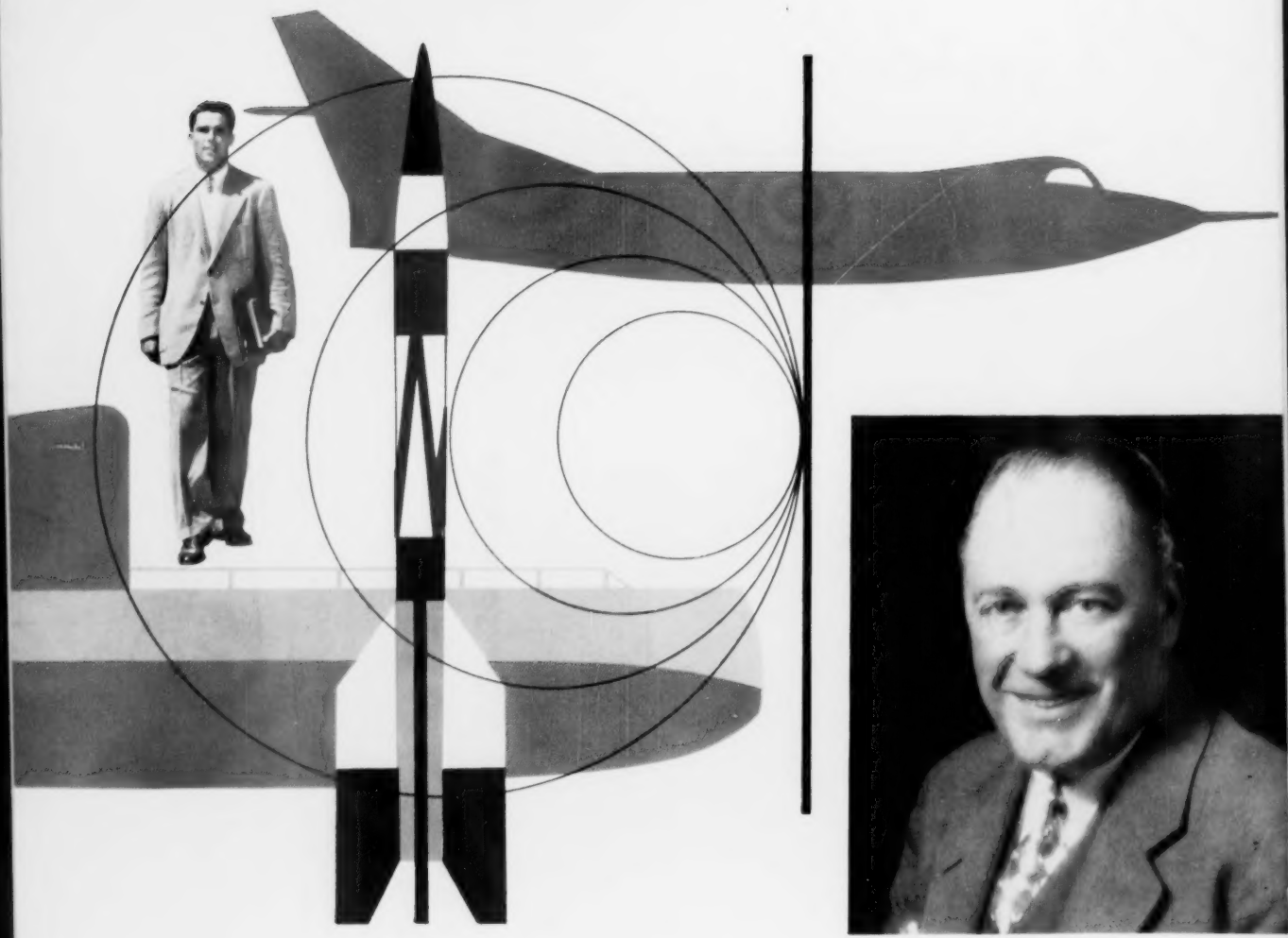
IN THIS ISSUE . . .

• National Defense Begins in the College

By

CHERRY L. EMERSON, P.E.,

Former Vice President, Georgia Institute of Technology



Cherry L. Emerson, P. E.

Results of An Opinion Survey on the Effectiveness of Present Engineering Registration Laws

How Progress Rode the Iron Horse—A Photo Story

Plus: NSPE's Capitol Hill Testimony . . . A Special AE Report . . . From Washington . . . Other Features

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46 Major Projects at Lockheed

Advance Careers of Engineers

Lockheed projects cover virtually the entire spectrum of aeronautical engineering endeavor, including turbo-prop, turbo-compound and jet transports; jet fighters, trainers and bombers; vertical rising aircraft; nuclear applications to aircraft and many other significant classified activities.

It is the largest development and production program in the company's history, with 13 models already on assembly lines.

Diversification such as this offers engineers:

- More opportunity for promotion – because there are more h echelon positions to be filled on such a large number of proj
- More career security – because Lockheed activities span so many phases of aeronautical effort.
- More stimulating work – because there is a wider range of assignments, because engineers have more scope for thei ability, because a firm active on so many fronts of aviation welcomes and rewards fresh thinking, new ideas.

To engineers who lack aircraft experience:

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A report on "High Heat Treat Steel" taken from one of Lockheed's monthly engineering and manufacturing forums is available to interested engineers. Address requests to the forum chairman, E. H. Spaulding.

Engineers interested in Lockheed's expanding development and production program are invited to write to E. W. Des Lauriers, Dept. MP-2-8.

Below: Lockheed engineers at work on various projects

Operations Research study on overseas transport routes

WAVY P

Design study on hydraulic requirements of new transport

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AUGUST

1955

American Engineer
21st YEAR OF PUBLICATION
1935 – 1955

Kenneth E. Trombley, Editor

Mary Margaret Milbrath, Assistant to the Editor

Vincent F. Waters, P.E., Chairman, Publications Committee, NSPE

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NSPE Officers

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—President Dwight D. Eisenhower

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NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
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Aerodynamic meeting on high speed fighter

Fatigue test on Super Constellation skin

Antenna pattern study on radar search plane

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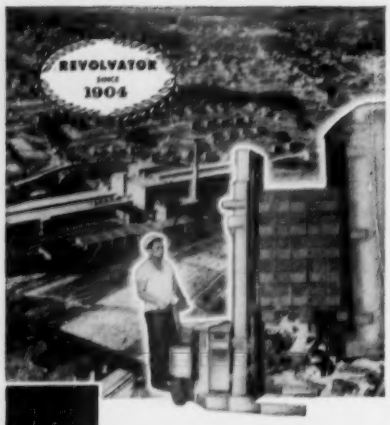

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Letters to the Editor

Killian Story . . .

Dear Editor:

After carefully reading the April, 1955, issue of the *American Engineer* I have come up with two "One-Point Programs for Technological Vigor."

The first article read was that by Dr. James R. Killian, Jr., "A Four-Point Program for Technological Vigor." The next was a remarkable item on page eight. Here Senator J. William Fulbright points out that although the country needs scientists and technicians it also needs well educated men and women who can think clearly on serious problems confronting the nation.

My first "One-Point Program for Technological Vigor" would be to put Dr. Killian, Jr., in the Senate and make Senator J. William Fulbright, President, Massachusetts Institute of Technology. Being a pro-Joe McCarthy Republican I am not without careful consideration upgrading Mr. Fulbright from a Senator to a President.

My second "One-Point Program for Technological Vigor" is more sensible. Professional engineers should have a degree in the arts before they start specializing. Learn how to build a life before you start learning how to earn a living.

Most, if not all, leaders in the fields of religion, medicine, law and literature, and education, too, obtain a degree in the arts before they begin specialized training in theology, medical schools, law schools, and universities.

Priests, ministers, doctors, lawyers, and teachers are recognized universally as professional people. A degree in the arts is, and always will be, the keystone in the buildup of their character and training. The engineering profession should be no exception.

Program Number Two should satisfy both Dr. Killian and the Senator from Arkansas. They might even go along with program Number One.

Dr. Killian wants engineering to be a liberalizing, humanizing, and creative force that serves man spiritually as well as practically. Engineers can certainly provide practical services for their fellow man.

However, engineers must learn the truths and absorb the wisdom of the classics, ancient and romance languages, philosophy, normal psychology, history, religion, literature, law, sociology, and economics to serve man spiritually and intellectually.

This is a tough program. Your doctor and lawyer did it, why not you?

PETER A. SEWARD, A. B., P. E.,
Swampscott, Mass.

Sell "P.E." . . .

Dear Editor:

It is possible that we already possess the distinguishing, brief designation, so urgently sought by so many Professional Engineers: P.E.

What is needed is a continuing educational program, such that 164 million Americans know and recognize the complete definition of a P.E.

The objective is to distinguish our profession from the endeavors of the technicians, the craftsmen, the operators, etc.

We must emphasize to all the legal violations of incorrect use of the title P. E., and must educate 164 million people that whereas an advertised extermination engineer may be a valuable exterminator and a valuable member of society; he is a phony engineer, and subject to arrest for misrepresentation.

It may be possible to have the P.E. designation registered in the patent office. Certainly a uniform national definition is in the public interest, worthy of an act of Congress, if necessary to establish it.

E. N. IBERG, P. E.,
Baltimore, Md.

More Designations . . .

Dear Editor:

It is with a mild degree of interest mingled with curiosity that I have read in your correspondence column several letters discussing the use and misuse of the word engineer. The idea seems to be to supplant that word with some other less subject to possible misuse and construable only with "professional" engineering.

This question can be of no great import to the writer, who in a year or so will arrive at the fiftieth anniversary of his attainment of an engineering degree, which followed upon bachelor degrees in arts and in science. However, if he can offer some suggestion that may be helpful to those to whom this question is of moment, perhaps these lines may be justified.

Of all qualities that should characterize an engineer, perhaps there is none, other than integrity, more necessary and desirable than to be practical. Answers that possess intrinsic merit otherwise but are impractical, may be found by the score, not only for questions of nomenclature but for many others.

How long does the reader suppose it would take for degrees to come into vogue, designated by words from a foreign language, or by hybrid names like the freak composites used on merchandise? Or, if colleges continued, as they undoubtedly would continue, to confer degrees upon the present basis, how long before any illegitimate etymology would be recognized in practice? Whatever merits such words might have, they would lack the *sine-quanon* of being practical.

Consider for a moment even the substitution of "engineman" for a locomotive or stationary engineer, which was proposed years ago. How far has it got? Yet it was a comparatively simple expedient without

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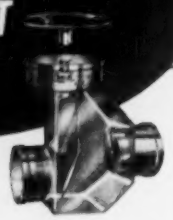

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any impractical aspect, except the automatic handicap of that inertia which puts brakes on so many proposed changes. "Es el costumbre" pervades more countries than that of its origin.

To the writer it seems more feasible to build upon foundations already laid, rather than to start anew from the ground up. By a foundation already laid I mean the designation P.E. already in vogue with NSPE and with many of its members. Then embody therewith some modification, which I believe could be done in a natural, practical, easy way, not greatly subject to the inertia just mentioned.

For individual use P.E. is not too definitive, although in some connections it serves very well. If a more definite form were used, it would serve to emphasize the distinction between legal and illegal use of the word "engineer," and this, after all, is what some AE readers seem to be seeking.

Probably there are others beside the writer who are adverse to supplanting the symbols for their college degrees by the letters P.E. After attainment of an engineering degree, and then after compliance with legal requirements for registration (which, after all, is "a horse of another color"), why should not the two be combined? Taking for illustration the four branches of engineering represented by four of the "founder societies," the score would be:

Branch of Engineering	Collegiate Degree and Designation	Professional Designation
Electrical	E.E.	P.E.E.
Civil	C.E.	P.C.E.
Mechanical	M.E.	P.M.E.
Mining and Metallurgical	E.M.	P.E.M.

The initials in the last column are offered as illustrative only. Some other combination with the same basic idea might be found preferable. For instance, a small "r" or "p," or a capital "R" or "P," either before or after the other letters, might be used with the same significance.

It seems to the writer that a system of this kind would distinguish effectively between legitimate and non-legitimate "engineers," and would be very adaptable to individual use.

ROBERT F. WOOD, E. M.,
Washington, D. C.

Wanted: Executives!

Dear Editor:

The article by Mr. J. L. Handy (Wanted: Professional Engineer Executives, AE, July, 1955) was most timely. It has been truthfully said: "There is always room at the top." I wonder if Mr. Handy ever tried to hire a company president. It is about the hardest thing there is to do. While I never had to do it myself, I was close to a job of this type and was called on by the principals for advice. My advice was: "You cannot hire a president. If he is any good, he is not for sale. If he is for sale, he is no good. The best way to get a president is to train one. If that is impossible, the only other way is to pick a man that you would like who has a job with some other company, buy a voting control of that company, merge it with yours and take over the president." That is what the company in question did. It cost them about fifty million dollars.

Mr. Handy's list of prerequisites for a good executive are good but secondary.

(*Continued on page 46*)

AN OLD PROVERB:

"He loses all . . .

who loses
the right moment"

This is a good time to consider whether or not the moment has come for you to make the change in your employment that can mean the beginning of a successful, productive and happy future.

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PROFESSIONAL NEWS IN CAPSULE FORM

A Roundup of Late Events for Professional Engineers

Dr. Margaret Hutchinson Is Given Award

Dr. Margaret H. Hutchinson of Stone & Webster Engineering Corporation, Boston, was given the annual award of the Society of Women Engineers for "outstanding achievement" in the profession at the Society's annual award dinner held late in June in Hollywood, California.

Dr. Hutchinson, who is a member of the Massachusetts SPE and NSPE, was also the first woman to be admitted to the American Institute of Chemical Engineers. She is also the only woman to date who has received a Doctor of Science degree in chemical engineering from the Massachusetts Institute of Technology. In her work as a full-fledged engineer with Stone & Webster, she holds top responsibility in the development and design jobs to which she is assigned. These have included such major plants at home and abroad as units for the volume production of penicillin, huge oil refinery facilities at Abadan, and units for high production of synthetic rubber.

Dr. Hutchinson is married to William C. Rousseau, also an engineer with the Badger Manufacturing Company of Cambridge and a member of the MSPE and the National Society. The couple reside in Reading, a Boston suburb, with their eight-year-old son, Billy.

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Johnson Gets Top Post With Kansas Highway Dept.

Walter G. Johnson of Topeka, a leading member of the Kansas Engineering Society and a past national director of NSPE, has been named chief engineer for the Kansas State Highway Commission.

Mr. Johnson has been associated with the Commission in various capacities since 1928. For the past ten years he has served as engineer of secondary roads, and he is considered one of the country's outstanding authorities on secondary road problems. He is the author of numerous papers on various phases of this subject.

His professional activities have also included active membership in the Kansas Society of Professional Engineers before it merged with the KES.

"All right, you may issue Mr. Dobson one new 4H pencil—and have him sign for it."

Michigan State Honors Outstanding Engineers

Eight of the country's outstanding engineers, including three NSPE members, were honored by Michigan State College during its recent centennial symposium on "Automation—Engineering for Tomorrow."

Citations for distinguished professional service were presented to: Verne L. Ketchum, scientist, writer, and chief engineer of Timber Structures, Inc., Portland, Oregon; Christian F. Beukema, president, Michigan Limestone Division, U. S. Steel Corporation; T. Frederick Burris, chief engineer, Chesapeake & Ohio Railways; Maurice J. Day, director of research and development, Crucible Steel Company; James Harold Foote, president, Commonwealth Associates, Inc.; Raymond F. Giffels, secretary, Giffels & Vallet, Inc.; Stanley B. Hunt, chief engineer in charge, St. Lawrence Seaway Project; and Arthur Vinson, vice president of manufacturing, General Electric Company.

Messrs. Ketchum, Foote, and Giffels are the NSPE members, Mr. Ketchum being a member at large while the other two belong to the Michigan SPE.

Food Facilities Engineering Society Is Organized

Fourteen of the United States' leading food facilities consultants have announced their establishment of a new association—the Food Facilities Engineering Society.

The primary purpose of the organization will be to promote research and improve design of public food facilities, and to foster and further food facilities engineering and designing as a recognized profession, according to the group's announcement.

Officers of the new Society are: Fred Schmid, Los Angeles, president and treasurer; John W. Hargrave, Montgomery, Ohio, vice president;

and N. Bert Persson, St. Paul, Minnesota, secretary. Executive Board members are: Arthur W. Dana, New York; Ralph J. Mulhauser, Houston; J. Earle Stephens, Detroit; and Sam V. Wells, Chicago. Vice President Hargrave and Board Member Stephens are also members of NSPE.

Two other NSPE engineers are among the founding members of the new Society. They are Frank T. Hilliker of St. Louis and W. B. Holmes of Houston.

Others joining in establishing the association are: Alvin W. Anderson, San Antonio; John R. Forsyth, Wild Rose, Wisconsin; Hans J. Isler, Detroit; Stacey Keates, Pittsburgh; and Howard L. Post, New York.

Headquarters of the Society will be located in Los Angeles.

❁

In-Plant Training For Degree Credit Recommended

Reputable in-plant training courses should be accreditable toward advanced degrees in engineering or science, according to the opinion expressed by Robert C. Kintner, professor of chemical engineering at the Illinois Institute of Technology, Chicago. Professor Kintner's recommendations in this regard were placed before the recent annual meeting of the American Society for Engineering Education at University Park, Pennsylvania, in a paper which was read in his absence by Stanton E. Winston, dean of the evening division at Illinois Tech.

Kintner admitted that in-plant courses given by industrial organizations sometimes do not meet the high academic standards set by graduate schools. Once such standards are met, however, he declared that "there is no reason to penalize an employee (who is working toward an advanced degree) because he took a company course. He should not be made to repeat the course in a college classroom and be bored with the procedure."

He pointed out that most graduate schools do not permit, or at best, limit, the transfer of credits from other universities and colleges. Illinois Tech, like most other accredited institutions, accepts the transfer of only a small amount of graduate credits, he stated.

In reference to credits which are acceptable, however, he continued, "After satisfying ourselves that a company-given course is of high caliber, is given by a competent teacher, and is a valid part of a degree pro-

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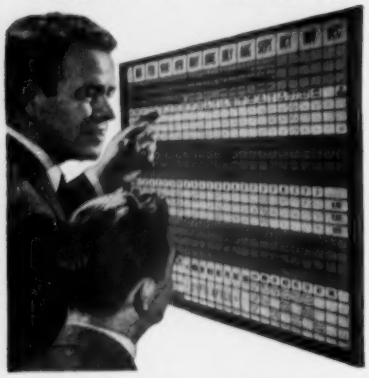

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gram existing on the campus, we see no reason to differentiate between such a course and one given at a distant college."

He cited in particular Illinois Tech's experience in accrediting in-plant courses of the Commonwealth Edison Company of Chicago, some of which nearly duplicate those offered in the Institute's Electrical Engineering Department. "Our Electrical Engineering Department has found that a satisfactory performance in the examinations given by the Commonwealth Edison instructor is a sufficient criterion to establish credit," he explained.

⚙

California Men Receive ASTM Award

Harold G. Mason, a member of the California SPE and NSPE, and John A. Bishop, both of the Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, California, were recently named recipients of the C. A. Hogentogler Award of the American Society for Testing Materials, together with Philip P. Drown and L. A. Palmer of the Navy's Bureau of Yards and Docks, Washington.

The award was presented during the Society's 58th Annual Meeting, which also marked the installation of Claire H. Fellows as new president of the ASTM. Mr. Fellows, who succeeded N. L. Mochel of the Westinghouse Electric Corporation in the post, is engineering and research director of the Detroit Edison Company.

⚙

Paul Weber in New Post

Dr. Paul Weber, professor of chemical engineering and director of the School of Chemical Engineering at the Georgia Institute of Technology, has been appointed Dean of Faculties, according to an announcement by President Blake R. Van Leer. In his new position, Dr. Weber will be in administrative and executive charge of the Engineering College, the General College, the Graduate Division, the Army, Navy and Air Force ROTC Units, and the Cooperative Division.

Active in professional as well as educational circles, Dr. Weber is a past president of the Atlanta Chapter of the Georgia Society of Professional Engineers. In addition to his GSPE and NSPE membership, he also belongs to the American Society of Metals, the Georgia Academy of Science, the Georgia Engineering So-

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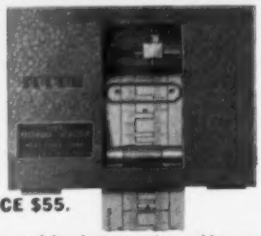

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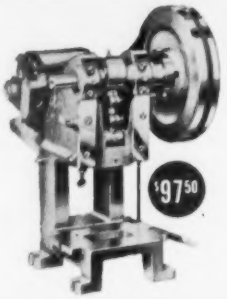

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ciety, the American Society for Engineering Education, the American Institute of Chemical Engineers, the American Chemical Society, and such honorary fraternities as Tau Beta Pi, Sigma Xi, Phi Lambda Upsilon, and Phi Kappa Phi. He was appointed this year to the Georgia Board of Registration for Professional Engineers and Land Surveyors by Governor Marvin Griffin.

Dr. William M. Newton will now serve as acting director of the School of Chemical Engineering, succeeding Dr. Weber.

❁

Summer Study for Teachers

More than two hundred outstanding science and mathematics secondary school and college teachers are taking special six-weeks courses this summer under the fellowship program sponsored by the General Electric Company in cooperation with four leading colleges. Union College, Schenectady, New York; Case Institute of Technology, Cleveland, Ohio; Rensselaer Polytechnic Institute, Troy, New York, and Purdue University, Lafayette, Indiana, are the four schools where the teachers are taking advanced work in their specialties.

The program is one of a series underwritten by General Electric to improve teaching in secondary schools and to promote an increase in student interest in science and math courses. Teachers from twenty-four states and the District of Columbia are participating in this summer's schedule.

❁

Better Utilization Urged

"With the present and predicted shortage of trained people, we shall seriously fail in our obligations if we have a highly trained person spending any regular or appreciable part of his time on work which is repetitive and non-challenging to his training and talent," said Clarence H. Linder, General Electric Company vice president, in presenting a paper at the recent Summer General Meeting of the American Institute of Electrical Engineers in Swampscott, Massachusetts.

"We know some ways out of this predicament," Mr. Linder, who is also an NSPE member, continued. "Computing machines may be used to carry heavy loads of analytical work which, although exceedingly complex, may be more laborious than creative. The concept of technician and engineering aide positions is another way out; this concept involves pruning the highly trained person's position of elements which can be bundled together to create a position for persons of limited technical training to whom the work will be a satisfying challenge."

Another point relative to staffing made by Mr. Linder during his address was that : "If we do a good job of technical planning, of identifying our needs for technical work and skills, of stating our critical problems and of designing positions, it becomes more and more apparent that the man best prepared for the bulk of engineering work in industry today is the man broadly trained in fundamentals of science and mathematics and less intensively trained in the details of currently useful devices. With this broad technical training should also be integrated a feeling for the social sciences, the humanities and the communication of ideas. A significant part of our staffing obligation as product engineering management, then, is to cooperate with our technical schools in making known the nature of our requirements and in helping to reapportion the training load between that which is best done in school

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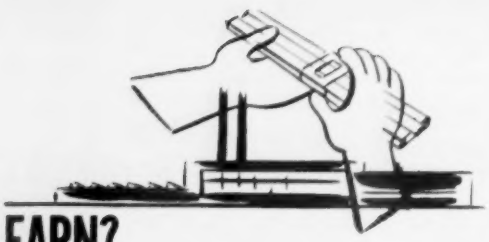

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❁

Lt. Col. Giesen Takes Iceland Post

Lieutenant Colonel Robert J. Giesen, Corps of Engineers, USAR, has been appointed the new chief of construction and engineering in the Corps' area office at Keflavik, Iceland.

Col. Giesen, who most recently has been serving as resident engineer at Fort G. G. Meade, Maryland, is a member of NSPE and the Society of American Military Engineers. He holds a B.S. from the University of Wisconsin.

❁

C. Y. Thomas On Water Resources Board

Governor Fred Hall of Kansas has recently announced the appointment of a seven-man Water Resources Board created under the authority of an act of the State Legislature. One of the three engineers named to the new Board is C. Y. ("Kit") Thomas, a former vice president of the National Society of Professional Engineers.

Mr. Thomas, who is also vice president in charge of production for the Spencer Chemical Company, is one of the foremost engineers in the Missouri Valley area. He was a charter member of the Kansas SPE, which has recently merged with the Kansas Engineering Society.

❁

P. H. Robbins Continues As Scholarship Director

Paul H. Robbins, executive director of the National Society of Professional Engineers, has been renamed director of fellowships for Tau Beta Pi, the national engineering honorary fraternity. His new term as fellowship director will extend for four years.

❁

Zinn Heads Nuclear Group

Announcement has been made of the election of Dr. Walter H. Zinn as first president of the American Nuclear Society, a new organization composed of scientists and engineers engaged in full-time work on atomic energy. Dr. Zinn is director of the Argonne National Laboratory of the Atomic Energy Commission at Lemont, Illinois.

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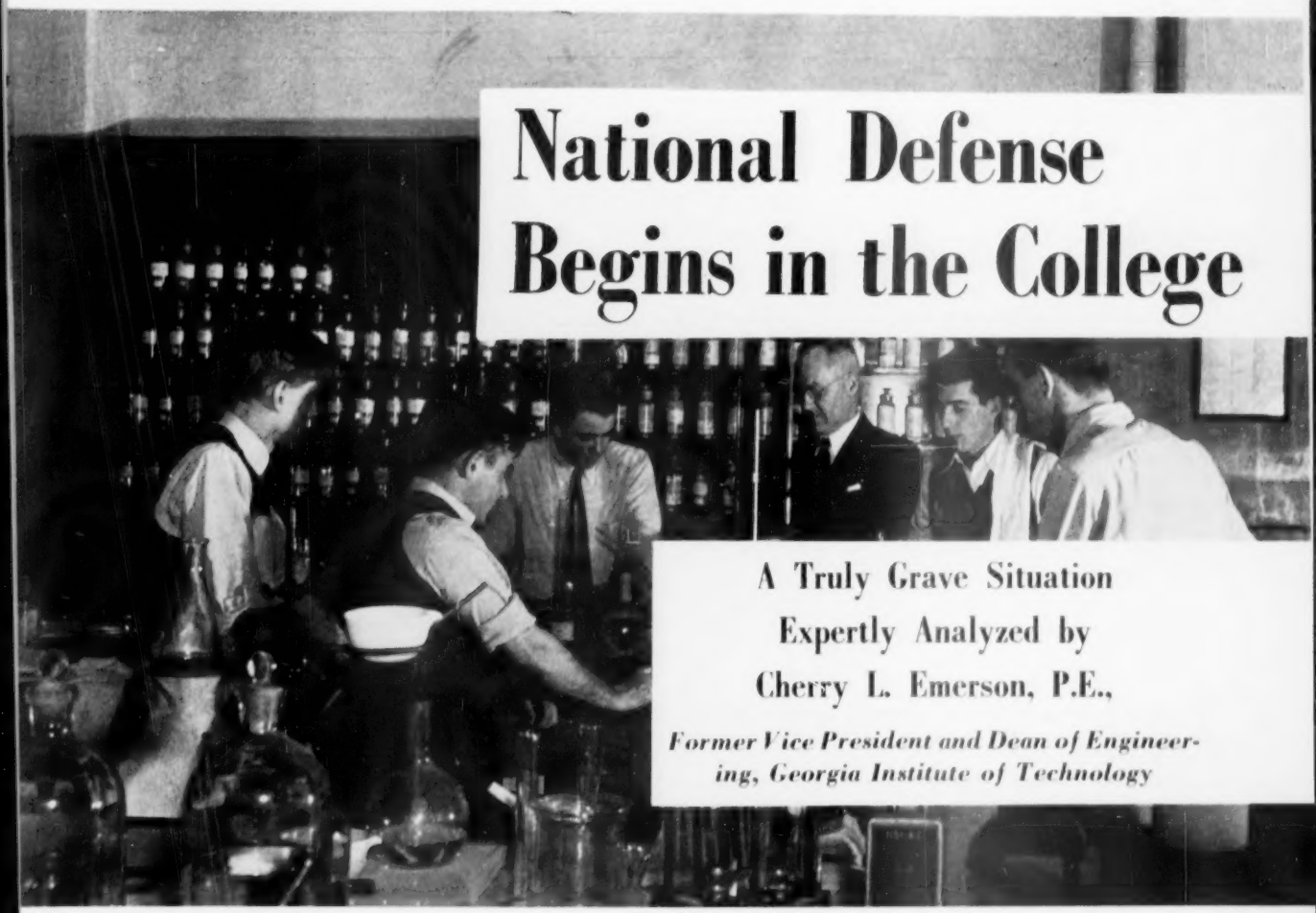


National Defense Begins in the College

A Truly Grave Situation Expertly Analyzed by Cherry L. Emerson, P.E.,

Former Vice President and Dean of Engineering, Georgia Institute of Technology

IN A WAY of thinking, the world situation has become simplified. There are two hostile camps—the Communists headed by Russia, and the free world headed by the United States. Other countries fall into the relationship of allies, satellites, associates, or within one of the two spheres of influence. Reliable authority, including the President of the United States, holds that this hostile balance may continue for a generation or even fifty years, unless World War III intervenes. In this event, both camps may be substantially destroyed.

Our best news analysts think the possibility of war is rather remote. The United States will not precipitate a war, basically because it is a Christian country, and realizes that provoking war unleashes all of the forces of evil. The Russians do not have the same deterrent, but control of that country is now quite apparently in the hands of the military forces, and this group will not start a war unless they are quite convinced that they will be able to win it and with some possibility of survival after winning. It does seem logical, therefore, to anticipate quite a long period of stalemate with an uneasy and unpleasant truce.

On the basis of these general observations, we make certain comments. Some of the assertions will undoubtedly seem dogmatic because space does not permit an explanation of the reasoning which has led to each specific conclusion stated; too, there are exceptions to practically all of the statements. But the statements are generally sound, and are supported by evidence from sources that are quite dependable.

We have so many avenues of public information and the experts on each have been so concerned with the possibilities of conflict that even the layman has obtained a fairly good idea of what another world war would be like. The various bombs of fission and fusion have provided explosives so much more powerful than the old style T.N.T. that a new war dimension is produced. The United States is capable of delivering in one month's

Snowdrop . . .

time explosives which would be equivalent to all those delivered by all the air forces of all the combatants during a year of World War II.

The United States has lost its uniqueness in possession of nuclear energy devices, but still is in a position of immense quantitative superiority to its enemies. The problem has now become one of delivery, whether by plane, artillery, guided missile, rocket, or submarine. The British are just now criticizing their Government for planning a large increase in the production of atomic weapons and in the strategic air force, on the argument that the money should perhaps be better expended on research in guided missiles for the delivery of bombs to be provided by the United States. Many Britishers feel that money should be spent on brains rather than on manufacturing facilities.

Frank H. Higgins, Assistant Secretary of the Army, (center) inspects the facilities of the Harvey Aluminum and Harvey Machine Co., Inc., Torrance, California, during a tour of the Army's engineer-hungry guided missile industry in Southern California. Accompanying Secretary Higgins are his aide, Lt. Col. William R. Campbell and Leo M. Harvey, chairman of the board at Harvey.

WHILE our own development is to a considerable degree shrouded in military secrecy, we do know that arrangements are being made to test guided missiles over a five thousand mile range, and that research is progressing on the inter-continental ballistic missile. We know from our *Nautilus* that atomic propulsion has added importance to the submarine, and that there is a terrific competition between measures and countermeasures for the detection of submarines.

For concealment, undersea craft have been given a rubber coating which defies the old methods of search, but recently we have been relieved to hear that certain new methods of detection are being perfected which will enable us to locate them with the same ease that radar detects hostile aircraft. Work goes on with serious purpose about the establishment of an artificial satellite perhaps a thousand miles above the earth from which in isolated safety the world could be patrolled and controlled.

All of these activities and many others too numerous to catalog, indicate that the new military potential is largely dependent upon science. There is a tremendous race between the creative ability of American scientists and Russian scientists. It is reasonable to say that the survival of our country depends upon maintaining our lead in this race. We have no reason to doubt that if the Russians surpassed us in scientific accomplishment, there would be nothing in their philosophy to deter them from an H-bomb attack on our air fields and atomic installations. And, if they achieve superiority they will almost certainly be aware of it.

Gradually, and without complete realization, we have come to the point where our magnificent industrial productive capacity might be considered obsolete. This same question could be raised about our great fleet and even, perhaps, the existing aircraft of our strategic air command. We are coming to see that as a first consideration our scientific ability is being pitted against that of the Russians, and that the stake for the winner is control of the world.

With very great reluctance, we devote the abilities of the scientists in industry, government, and our universi-

This series of pictures beginning on the opposite page, graphically depict how one unit of our Armed Forces, the 127th Airborne Engineer Company, depends upon engineer-developed equipment and methods to carry out its mission. Soon after the soldiers landed they had bull-dozers, rollers, graders, and their pulvi-mixer at work to establish a snow-compacted airfield. Soon the compaction is ready for testing, above at right, and the signal is given for a C-47, photo at right, to land.

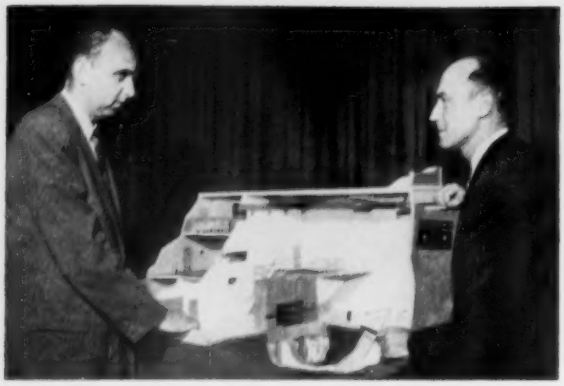
ties to problems of war, and only because self-preservation is the first law of nature. We have stated that no matter how greatly our scientific potential may exceed that of the Russians, we will not instigate a preventive war. It is a very terrible thing that we cannot believe the same about the Government of Russia, and yet our intelligence cannot be smothered by wishful thinking.

There is, of course, a small though long range chance that Russia's motivation might be changed. Whether we recognize it or not, our democracy and our liberty rest on the basis of the belief in religion and particularly on the Christian ethic, and religion still survives in the Soviet Union despite the vigorous official campaigns that have been conducted against it. It may well be that therein lies that necessary motivating force.

Moreover, the Russian leaders have at least been giving lip service to a desire for world peace in recent weeks. The "Summit" meeting at Geneva, which has just been concluded, is the foremost current example of this change of pace. And further friendly overtures have been made in the granting of visas to such groups as the American farmers now touring Russia while a group of Soviet agricultural officials are being received in Iowa. We can only hope, while continuing to be as alert as possible, that these are indeed signs pointing to improved world conditions. Meanwhile, however, we must bolster our scientific efforts.

On the thesis that we are dependent upon science for survival, let us take a brief look at our scientific situation. The striking thing is that our scientists are so few. They probably represent at present about one-tenth of one per cent of our population. While it is common knowledge that engineers are in very short supply, the lack is not so devastating as the shortage of able scientists. Practically every research organization in the country is searching for talent, and is endeavoring to proselyte the able members of other organizations. Industry, because of its greater material rewards, is able to take scientists away from government laboratories and from colleges and universities. It has exercised this strength without much regard for the results to the general good. Many magnificent government laboratories with millions of dollars worth of equipment are so lacking in operating talent that their contributions are ineffective. The faculties of colleges have been a particularly fertile field for the inroads of industry. As a single example, the research director in a Southern university was employed not long ago by industry at three times the salary he was receiving from the college. This process continues with deadly effect.

Magnificent government installations are neutralized, and colleges are rapidly losing their ablest and most creative individuals. It would be natural to assume that, as intelligent people, we are making every effort to supply the shortage, not only in scientists, but also in engineers. This, however, does not seem to be the case. We are told by no less an authority than the National Science Foundation that Russia is educating a great



North American Aviation scientists, Dr. Robert Loftness, left, and Dr. Harry Pearlman, discuss a model of the first nuclear reactor for private industrial research which the Armour Research Foundation plans to operate in Chicago. Designed by North American's Nuclear Engineering and Manufacturing Department, the new rector is scheduled to be used by Armour at the Foundation's facilities on the Illinois Institute of Technology campus for nuclear research in the development of non-military, or peacetime applications of atomic energy.

Maj. Gen. Kenner F. Hertford, center, chief of the Army's Research and Development Office, inspects a quarter-ton truck prepared for aerial delivery by the Airborne School at Fort Benning. With him are Dr. John E. Vance, left, the Army's chief scientist and deputy to Gen. Hertford, and Richard S. Morse, president of the National Research Corp., Cambridge, Mass., and vice-chairman of the Army Scientific Advisory Panel. They were among 54 engineers and scientists at Fort Benning recently for a two-day research and development conference.

many more engineers and scientists than we, and we would be foolish to assume that the quality of the engineers and scientists produced by the Russians is greatly inferior to our own. We should remember that immediately following World War II, the Russians were very active in collecting the best of the German scientists and removing them to Russia.

The operation of selective service is helping to intensify the shortage by drafting young engineers and scientists from industry and the graduate schools. They are being taught the manual of arms and other ancient games while they should be learning the rudiments of scientific research and acquiring the competence to contribute to the winning of the scientific race. They should all have their military service deferred, not to make them a favored class, but to help our chances of survival. If our young technical people must be put in uniform, they should all be assigned to government laboratories compatible with the training they have already received.

Thoughtful people, confronted with a shortage of anything, study the sources from which that thing is to be obtained. As for scientists, there is one source and one source only, and that is from the graduate schools of our colleges and universities. Mathematicians, physicists, chemists, and engineers who are competent to do research and development work cannot be produced in any other way. Skilled mechanics can come up through a course of apprenticeship; businessmen can be trained in the "school of experience"; but scientists must have had the advantage of a formal education.

As an approximation, we might say that the best brains in our high school graduating classes go to college. The best brains among our college graduates are accepted as candidates in the graduate school. The best brains in this group come out some three years later with a Ph.D. degree or its equivalent. These are the men who will carry on the future scientific activities whether directed toward peace or war. This long process between high school and active participation requires six to ten years, and the period cannot be materially shortened. This activity of sieving and selecting is somewhat like the refinement of U-238 to U-235.

The selective process is not always accurate, but in general the most able young men in the field of science are those who have earned Ph.D. degrees from our better colleges. It is to be remembered that two mediocre scientists are not the equivalent of one who is really able and creative. Quality is even more important than quantity.

Since it would appear that the survival of all of us depends upon the quantity and quality of the product of these graduate schools, it is to be assumed that they are given every possible aid. We should expect the full resources of this great country to be devoted to their improvement, and take it for granted that their leaders and administrators are regarded as the most important and useful people in our country. The facts, however, totally fail to back up these assumptions. We have the grim paradox that the sole sources of the priceless ingredient which could save our country and our lives are not only neglected by and large, but also are subjects for policies which make it more and more difficult for them to produce the priceless ingredient at all.

There are in the United States approximately 1800 colleges and universities. Over half of these are now operating at a loss. Approximately one-half of these

(Continued on page 42)

About the Author . . .

Mr. Emerson

Cherry Logan Emerson, of Atlanta, Georgia, who retired as vice president of the Georgia Institute of Technology on July 1 of this year, has had a distinguished record in both industry and education. A graduate of the Georgia School of Technology with a B.S. in Mechanical Engineering received in 1908 and a B.S. in Electrical Engineering in 1909, he began his engineering career as an apprentice with the Westinghouse Electric & Manufacturing Company in Pittsburgh in 1909.

He worked in various capacities for the firm in Boston, Philadelphia (where he also studied at the Philadelphia Textile School), and Charlotte, N. C., before becoming an application engineer with the Duke Power Company in Charlotte. He later became chief engineer of Duke Power, then chief engineer of Robert and Company, Inc. of Atlanta, and finally, dean of engineering at Georgia Tech in 1945. In 1948 he succeeded to the vice presidency of the school.

—A Report on An Opinion Survey—

Engineering Registration Laws

By ORLAND C. MAYER, P.E.

Past Chairman, NSPE Registration Committee

DURING the 1954-55 administrative year just terminated, the Registration Committee of the National Society of Professional Engineers, of which I was then chairman, conducted a study of membership opinion on important questions relative to state registration laws for engineers.

For purposes of this study, the committee developed a comprehensive questionnaire which was mailed to two groups within the National Society's membership. Group I included officers, members of the board of directors, committee chairmen, members of the Professional Engineers Conference Board for Industry, state society presidents, state society secretaries, chapter presidents, and chapter secretaries. Group II was composed of a random sampling of the membership.

One thousand questionnaires were mailed to the individuals in Group I, and 422 of these were returned in time for inclusion in the survey. Five thousand were mailed to the engineers in Group II, and 1,988 of these were returned in usable form.

In addition to the sections pertinent to the registration laws, the questionnaires included a series of key identification questions designed to provide background information on the respondents particularly concerning date of first registration, how registration was achieved, principal activity, and branch of engineering.

Well over 90 per cent of the respondents of both groups were designated as P.E.'s. Of Group I, 98 per cent fell into the P.E. category, while 2 per cent were E.I.T.'s; in Group II, 92.5 per cent of the respondents were P.E.'s, while 7.5 per cent were E.I.T.'s. Approximately 20 per cent were registered prior to 1937; 40 per cent, between 1938 and 1947; and 40 per cent, subsequent to 1948.

In Group I, 37 per cent qualified for registration on the basis of written examinations; 8 per cent qualified through oral examinations; while 55 per cent were accredited on the basis of evaluation of experience only. In Group II, the number qualifying by written examination was 38 per cent; oral examination, 8 per cent; and evaluation of experience, 54 per cent.

The principal activities and the branches of engineering in which the respondents work break down as follows:

Principal Activity	Group I	Group II
Consulting	23%	25%
Teaching	3%	3%
Industrial or Public Utility Employment	36%	37%
Government employment	16%	15%
Other	13%	15%
Combination of two or more	9%	5%

Branch of Engineering	Group I	Group II
Chemical	2%	4%
Civil	44%	38%
Electrical	16%	19%
Mechanical	21%	25%
Mining & Metallurgical	2%	2%
Other	7%	5%
More than one branch	8%	7%

The registration laws themselves were covered by questions subdivided under six main headings: Organization of State Boards, Financial Considerations, Powers of the Board and Enforcement, Standards and Reciprocity, Qualifications of Applicants, and Fees. A copy of the questionnaire reflecting the composite answers of both groups in percentage form is printed at the end of this article. At the outset, however, it should be pointed out that there was no appreciable divergence of opinion between the individuals in Group I and Group II.

Organization of State Boards

By far the preponderant opinion supported the point of view that members of the State Board should be required to have at least 12 years of responsible engineering experience. The Board, composed of five members, should be composed of residents of the State and appointed for a five year term, with appointments being staggered and one made each year. Members of the Board should represent various branches of engineering and should be eligible for more than one term. All members of the Board should be registered.

Financial Considerations

An overwhelming majority of the respondents indicated that Board Members should receive all expenses incurred in the discharge of official duties. However, there was not complete agreement between Groups I and II with respect to the per diem allowance for Board Members. Group I (61 per cent) indicated that $10 was NOT a satisfactory amount, while 50 per cent of Group II indicated that $10 was satisfactory.

Of those who indicated that $10 per diem was not sufficient, more than 40 per cent recommended a per diem range of $25 to $35. Both groups agreed (by approximately 70 per cent) that there should be an established maximum. More than 80 per cent of the respondents felt that the Board should retain control of all monies received through administration of the registration law; however, they indicated by 53 per cent for Group I and 55 per cent for Group II that the Board should be required to obtain approval of the Governor, State Controller, or other official to expend monies received for administration of the registration law.

There was a strong indication (more than 75 per cent) that the annual renewal fee be continued as the primary source of financing the Board's operation. Of those who objected to the annual renewal fee being used in this manner, more than 63 per cent indicated the Board should receive an annual appropriation from the State Legislature to supplement funds received from new applicants, if necessary.

Powers of the Board and Enforcement

A clear majority indicated the Board should have power to: (a) subpoena witnesses; (b) take testimony under oath; (c) enforce the registration law by use of the injunction; (d) provide for fines and imprisonmen ($100 minimum, $500 maximum, imprisonment up to three months) for violators. A scant majority felt that the Board should rely on the State Attorney General or County Attorneys for prosecution of violations. Of those who objected to the reliance upon the State Attorney General for prosecution of violators, more than 80 per cent indicated the Board should have its own legal counsel with authority in the law to prosecute in the name of the Board.

Standards and Reciprocity

Seventy-two per cent of the respondents in Group I and 77 per cent of those in Group II indicated that the State Board should recognize the certificate issued by the National Bureau of Engineering Registration for reciprocal licensing in all cases; however, from 65 to 72 per cent did not feel the Board should recognize registration in other states as sufficient basis for reciprocal registration in all cases. Of those who did not feel the Board should recognize registration in other states as a sufficient basis for reciprocal registration, 85 per cent of Group I and 90 per cent of Group II thought the law should specify conditions under which registration in other states would be recognized; they also indicated by more than 85 per cent that the law should give the Board broad authority in exercising discretion as to reciprocal registration.

An overwhelming majority (96 per cent) felt the seal of a registered engineer should be required on all plans and specifications of work subject to the law, and that municipalities and other public bodies should be forbidden to accept or approve engineering designs unless done by a registered

QUESTIONNAIRE

	Group I (per cent)		Group II (per cent)	
	Yes	No	Yes	No
Organization of State Boards				
1. Should a member of the board be required to be a resident of the state?	98	2	95	5
2. Should the board be composed of five members? (If NO, comment on preferred number, with reasons.)	92	8	96	4
3. Should all members of the board be required to be registered?	97	3	96	4
4. Should appointments to the board be set at five years? (If NO, comment on preferred length of term, with reasons.)	87	13	89	11
5. Should appointments to the board be staggered, making one appointment each year?	97	3	97	3
6. Should members of the board be eligible for more than one term?	72	28	68	32
7. Should the law require that members of the board represent various branches of engineering?	74	26	82	18
8. Should the law require that the Governor secure the recommendations of the engineering society or societies of the state before appointment?	82	18	85	15
9. Should the law restrict the Governor to making appointments only from a list of nominees submitted by the state society or societies?	52	48	55	45
10. Should the members of the board be required to have at least twelve years of responsible engineering experience prior to appointment? (If NO, comment on desired minimum experience.)	88	12	90	10
Financial Considerations				
11. Is $10 per diem for board members while in attendance of official duties a satisfactory amount? (If NO, comment on suggested amount.)	39	61	50	50
12. Should board members receive all expenses incurred in discharge of official duties?	95	5	93	7
13. If YES, to question 12, should there be any maximum?	71	29	72	28
14. Should the board retain control of all monies received through administration of the registration law?	84	16	86	14
15. If YES to question 14, should the board be required to obtain approval of the Governor, State Controller, or other official to expend monies received for administration of the registration law?	53	47	55	45
16. Should the annual renewal fee be continued as the primary source of financing the board's operations?	83	17	76	24
17. If NO to question 16, should the board receive an annual appropriation from the state legislature to supplement funds received from new applicants, if necessary?	63	37	71	29
Powers of the Board & Enforcement				
18. Should the board have power to subpoena witnesses?	84	16	82	18
19. Should the board have power to take testimony under oath?	89	11	83	17
20. Should the registration law be enforced by use of the injunction?	91	9	89	11
21. Should the board rely on the State Attorney General or County Attorneys for prosecution of violations?	53	47	55	45
22. If NO to question 21, should the board have its own legal counsel with authority in the law to prosecute in the name of the board?	87	13	83	17
23. Should the law provide for fines and imprisonment for violations?	90	10	90	10
24. If YES to question 23, is a fine of $100 minimum and $500 maximum and imprisonment up to 3 months satisfactory? (If NO, comment on preferred fine range and imprisonment term.)	83	17	82	18
Standards & Reciprocity				
25. Should the board recognize the certificate issued by the National Bureau of Engineering Registration for reciprocal licensing in all cases? (National Bureau of Engineering Registration is an organization which determines basic qualifications of engineers as a means of facilitating reciprocal registration without the necessity of taking a re-examination.)	72	28	77	23

26. If NO to question 25, should the law specify the conditions under which the National Bureau certificate will be recognized? (If YES, comment on suggested conditions for recognition.)	75	25	72	28
27. Should the board recognize registration in other states as a sufficient basis for reciprocal registration in all cases?	28	72	35	65
28. If NO to question 27, should the law specify the conditions under which registration in other states will be recognized? (If YES, comment on suggested conditions for recognition.)	85	15	90	10
29. With reference to questions 25, 26, 27 and 28, should the law give the board broad authority to exercise discretion as to reciprocal registration depending upon the board's evaluation of the qualifications in general of each applicant for reciprocal registration?	86	14	88	12
30. Should the seal of a registered engineer be required on all plans and specifications of work subject to the law?	96	4	96	4
31. Should municipalities and other public bodies be forbidden to accept or approve engineering designs unless done by a registered engineer as indicated by the seal?	98	2	96	4
32. Should registered engineers from other states be permitted to practice without registering in the visited state for a limited period?	73	27	72	28
33. If YES to question 32, is a 30-day per year exemption satisfactory? (If NO, comment on recommended time.)	73	27	70	30
34. Should the law provide for registration of engineers only?	39	61	42	58
35. If NO to question 34, should the same law cover land surveyors under different sections?	88	12	89	11
36. Is a joint board for engineering and architectural registration desirable?	50	50	58	42
37. Should the registration certificate and roster refer to "Professional Engineer"?	91	9	91	9
38. Should the registration be for "Engineer"?	38	62	43	57
39. Should the law protect the words "Engineer," or "Professional Engineer," by providing penalties for those using such titles without complying with the registration law?	99	1	97	3
40. Should branches of engineering be recognized either in the law, the roster, or the certificate? (If desired, comment on these separate places of designation.)	53	47	67	33
41. Should the law provide for engineer-in-training registration?	88	12	81	19
Qualifications of Applicants				
42. Should there be a minimum age for registration?	71	29	77	23
43. If YES to question 42, is the age of 25 satisfactory? (If NO, indicate preferred minimum age.)	80	20	79	21
44. Is graduation from an accredited engineering school a sufficient standard for registration as an engineer-in-training, without examination?	62	38	64	36
45. Is graduation from an accredited engineering school, plus four years of responsible experience sufficient for registration as a professional engineer, without examination?	32	68	35	65
46. If an examination is deemed necessary, should it be all written?	21	79	25	75
47. If NO to question 46, should the examination be all oral?	9	91	10	90
48. If NO to question 47, should the examination be both written and oral?	94	6	94	6
49. Is an examination of approximately 16 hours duration (both written and oral) generally satisfactory? (If NO, comment on desired length of examination.)	84	16	84	16
50. Should the law recognize registration by "eminence"? (If YES, suggest standards for "eminence" registration.)				
51. If an applicant is not a graduate of an accredited engineering school should he be required to have an additional four years of responsible experience (8 years total responsible experience)?	84	16	88	12
Fees				
52. Do you agree with the following fees? (If NO, indicate your suggestions.)	73	27	77	23

a. Application for P.E. license—$15.00.
b. P.E. certificate—$10.00.
c. P.E. renewal fee—$5.00.
d. P.E. reciprocal registration—$25.00.
e. Application for E.I.T. license—$10.00.
f. E.I.T. reciprocal registration—$5.00.

engineer as indicated by the seal. More than 70 per cent felt that registered engineers should be permitted to practice in another state without registering in the visited state for a limited period, and more than 70 per cent felt that a 30-day per year exemption was adequate. With those who did not believe 30 days to be adequate, 61-90 days was listed as the predominant period.

Sixty-one per cent of Group I and 58 per cent of Group II did *not* believe the law should provide for registration of engineers only; more than 85 per cent of both groups thought the same law should cover surveyors. Slightly more than one-half thought a joint board for engineering and architectural registration desirable with Group I alone split 50-50.

Over 90 per cent indicated that the words "Professional Engineer" should be on the registration certificate. Only 40 per cent indicated that registration should be for "Engineer," while more than 95 per cent indicated a desire to have the law protect the words "Engineer," or "Professional Engineer." A majority felt that branches of engineering should be recognized either in the law, roster or certificate. More than 80 per cent stated the law should provide for engineer-in-training registration.

Qualifications of Applicants

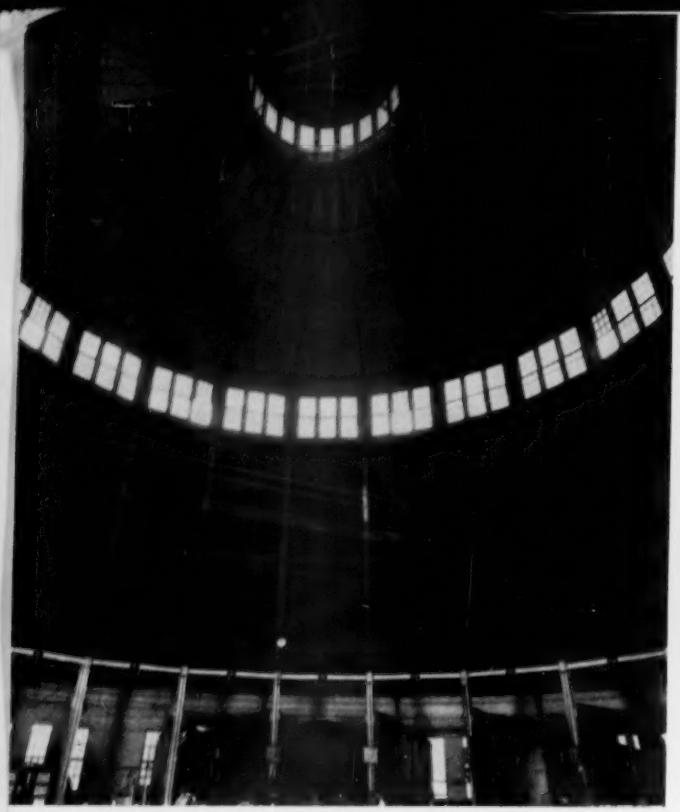
More than 70 per cent did not believe there should be a minimum age for registration; and more than 60 per cent believed graduation from an accredited engineering school a sufficient standard for registration as an engineer-in-training without examination. Sixty-eight per cent of Group I and 65 per cent of Group II indicated that graduation from an accredited engineering school, plus four years of responsible experience was *NOT* sufficient for registration as a professional engineer, without examination.

Ninety-four per cent felt the examination should be

(*Continued on page 45*)

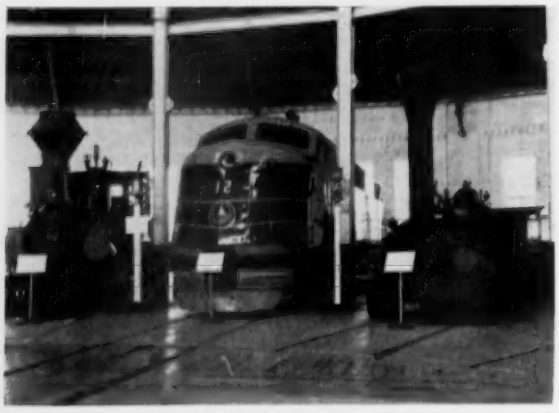
The Author . . .

Orland C. Mayer, P.E., former Vice President of the NSPE.



▲ Interior of the Baltimore and Ohio Transportation Museum, showing the unique method of supporting the huge cupula on a wire ring tied in to iron side spots.

▼ The Lafayette of 1834, Diesel #51 of 1937, and the Memnon of 1848. The historical sequence is broken here because it was necessary to place the diesel on Track 16, which is directly across the turntable from the entrance. The great weight of the #51, prototype of all streamlined diesels, cannot be turned on the antique turntable.



How Progress Rode the Iron Horse

—An American Engineer Photo Story—

▲ Peter Cooper, New York inventor, built the small locomotive, the "Tom Thumb," for the B & O in 1829. Its first successful trip, a distance of 13 miles from Baltimore to Ellicott's Mills, on August 25, 1830, put the horse cars previously operated on the railroad, out of business.

WINDING through the Potomac Valley, the Baltimore and Ohio Railroad follows a route which was originally surveyed by the Nation's first great engineer—George Washington. The construction of the road itself was begun on July 4, 1828, in the presence of the only surviving signer of the Declaration of Independence—Charles Carroll of Carrollton, who laid the symbolic first stone. Thus the history of America, the record of transportation progress, and the role of the engineer are inextricably combined.

Nowhere is this more apparent today than in Baltimore, Maryland, where the B&O's Transportation Museum holds history in a capsule and attracts scores of visitors to see its collection of famous locomotives and other memorabilia. And if some of the old "iron horses" look particularly familiar to the tourists, this strange jog to their memories is not without foundation, for a number of the old engines have "starred" in popular Hollywood-produced movies from time to time.

The museum is entered through the main doorway of the original Mount Clare Station where the first passenger ticket in America was sold just 125 years ago in 1830. The first trains went to Ellicott's Mills, 13 miles away, and the round trip fare for the journey on the rail road (as it was then termed in two words) cost just 75 cents. Also, another bit of history—through this station in 1844 passed Samuel Finley Breese Morse's famous first telegraph message, "What Hath God Wrought?", as it was transmitted from Washington to the nearby old Pratt Street Station in Baltimore.

The second building, which formerly contained a B&O printing plant and an employees' library, now houses special displays and scale models showing progressive steps in the development of many kinds of railroad equipment. It also includes (when it is not on tour) the B&O's automatically run three-track O gauge miniature railroad representing the Cumberland Division. Far more than a toy or a mere exhibit, it is used for study

by traffic engineers since it shows how three mainline tracks can perform operations usually needing four tracks when there is efficient use of crossovers and good signal control.

The museum's main attraction, of course, is the third building—the huge Mount Clare roundhouse where the retired locomotive is king. Not all of the giants of the rails and the other rolling stock on display here are originals. Too often the railway pieces were sent to the scrap heap before anyone thought of saving them as museum items for the edification of posterity. But the accuracy of design and detail of the full-scale reproductions—the majority made entirely of wood, but painted to resemble metal where metal was originally used—leaves nothing to be desired.

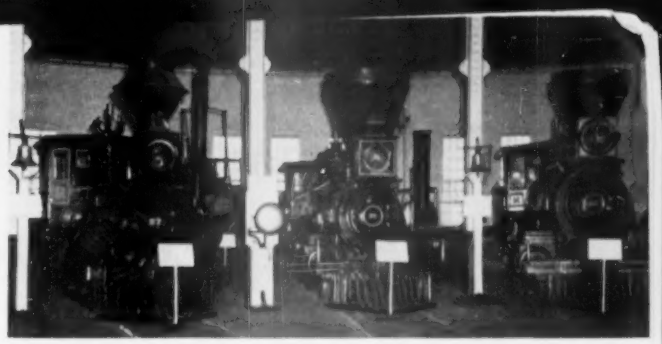
The wooden reproductions of such famous steam-driven vehicles as the British-built Stourbridge Lion, which proved too heavy for the American roadbed, the Brunton Steam Horse, and the engine designed for hauling heavy cannon by the French engineer, Nicholas Joseph Cugnot, and whose dangerously high-speed runaway performance in the Paris streets in 1769 landed its inventor in jail, are all part of the famous Pangborn collection which first fascinated visitors to the Chicago World's Fair of 1893.

To prepare his collection, which eventually came to number hundreds of items, Major Joseph G. Pangborn made a special trip abroad, under a B&O commission, studying and working from yellowed prints, sketches, and scale models when he could not find the originals of all pioneer self-propelled vehicles of England and the Continent. He also did extensive study in the U. S. Patent Office and with the engineering departments of various railroads.

Thanks are due to him, too, for the model of Sir Isaac Newton's steam engine, designed in 1680 on a propulsion principle that has since been put to practical use by the jet plane, and the replica of the famous Evans' Scow, probably the world's first amphibious vehicle. Designed and constructed by Oliver Evans, a Philadelphia blacksmith and boat builder, the scow had wheels that operated on land and a paddle wheel that propelled it through the water. Evans actually succeeded in driving it under its own power to the Schuylkill River; and then, after removing the land wheels, he steamed triumphantly down the Schuylkill to the Delaware.

The oldest piece of original equipment in the museum is the so-called "Bride's Coach," a sort of silk-upholstered stagecoach of the rails, which was imported from England for a Nova Scotia railroad in 1834. According to tradition, any girl who sits in it for ten minutes without talking will be married within the year. It is, needless to say, one of the most popular pieces with the ladies who visit the B&O exhibit.

A working model of the original Tom Thumb Locomotive, built for the B&O by Peter Cooper, is one of the main features of the museum and can be operated under its own steam. The Tom Thumb is legendary because of its famous race with a horse staged in 1830 by Cooper and other design engineers who were tired of the fun being poked at them by men who thought that locomotives were ridiculous. Unfortunately, those early engineers had to endure the laughter a little while longer because the horse won! But that was only because the Tom Thumb threw the fan on its boiler, thus losing steam. And there were plenty of others who weren't laughing as witnessed by the surprising volume of designs entered immediately thereafter in the B&O-sponsored contest which offered a $4000 prize for a practical steam locomotive capable of efficient use on the grades and curves of the new American rail lines. The York Locomotive, built by Phineas Davis of York, Pennsylvania, which won the contest, is represented in the collection.



▲ **The Memnon of 1848, the William Mason locomotive of 1856 and the Thatcher Perkins locomotive of 1863. In the background can be seen some of the famous Pangborn collection of full-sized wooden models of very early types of locomotives. In the foreground can be seen part of the collection of B & O bells and gongs.**

The entire exhibit is in rough historical sequence, and progress in rail transportation from the days of the Tom Thumb and the York can be traced right down to the diesel of today. Many of the later locomotives are originals and are still capable of operating under their own power after many years of B&O service. Such predecessors of the iron horse as the pioneer horse drawn cars, and even Conestoga wagons, centuries-old ox-carts, and rickshaws, give mute testimony to man's continuing struggle with the transportation problem. Then there are replicas of early barrel cars used for hauling flour, the forerunners of the present-day gondola cars; iron box cars used for the transportation of ammunition during the Civil War; and many other curios and relics from the march of transportation.

In each item can be seen the fine hand of the engineer, or at least of his imaginative and creative predecessors. Transportation, whether by land, sea, or air, has always been the engineer's own industry; and nowhere is this pointed up more sharply than in the Baltimore and Ohio collection which offers to the visitor an exciting lesson in the sweep and scope of progress made in mass land transportation through his efforts.

Without the railroads the development of vast stretches of the United States would have been far slower, or even impossible. Without engineering genius there would have been no railroads at all.—***End.***

▲ **This 10-wheel Camel passenger locomotive was designed by J. C. Davis, Master of Machinery, and built at Mt. Clare Shops, Baltimore, in 1873, for service over the famous 17-mile grade west of Cumberland.**

ASEE Report Evaluates Engineering Education

In May, 1952, a special Committee on Evaluation of Engineering Education was appointed by S. C. Hollister, then president of the American Society for Engineering Education. The purpose of the committee was to make a thorough study of the objectives and effectiveness of engineering education and to make recommendations, as a result of its study, for changes that would improve the quality of engineering education in keeping pace with rapid technological advances and provide for well-equipped engineering leaders in the future.

More than 200 educational reports from institutional committees on engineering education, engineering societies, industrial organizations, and individuals were reviewed by the committee during the course of its three-year study. The conclusions derived have now been published by the ASEE under the title, *Report on Evaluation of Engineering Education, 1952-1955.*

The thoroughly detailed report analyzes and explains the objectives of engineering education, discusses the selection and development of the engineering faculty, reviews the evolution of engineering curricula, considers special factors that influence undergraduate achievement, and takes up problems and questions related to graduate study.

Ten recommendations for the over-all strengthening of engineering education were made by the committee as a result of its work. They are as follows:

1. A strengthening of work in the basic sciences, including mathematics, chemistry, and physics.

2. The identification and inclusion of six engineering sciences, taught with full use of the basic sciences, as a common core of engineering curricula, although not necessarily composed of common courses.

3. An integrated study of engineering analysis, design, and engineering systems for professional background, planned and carried out to stimulate creative and imaginative thinking, and making full use of the basic and engineering sciences.

4. The inclusion of elective subjects to develop the special talents of individual students, to serve the varied needs of society, and to provide flexibility of opportunity for gifted students.

5. A continuing, concentrated effort to strengthen and integrate work in the humanistic and social sciences into engineering programs.

6. An insistence upon the development of a high level of performance in the oral, written, and graphical communication of ideas.

7. The encouragement of experiments in all areas of engineering education.

8. The strengthening of graduate programs necessary to supply the needs of the profession, conducted in those institutions that can:
   a. provide a specially qualified faculty,
   b. attract students of superior ability, and
   c. furnish adequate financial and administrative support.

9. Positive steps to insure the maintenance of faculties with the intellectual capacity as well as the professional and scholarly attainments necessary to implement the preceding recommendations. These steps include:
   a. well-established recruitment, development, and evaluations procedures,
   b. favorable intellectual atmosphere, reasonable teaching loads, and adequate physical facilities, and
   c. salary scales based on the recognition that the required superior faculty can be secured only by competitive remuneration, since professional practice in industry and government is inherently attractive to the best minds in engineering.

10. The consideration of these recommendations at this time before the problems of educating greatly increased numbers of engineers become critical.

Consulting Engineer Subject to W-H Law, Court Says

The United States Court of Appeals, Eighth Circuit, has ruled that the professional services rendered by a consulting engineer are covered by the Federal wage-hour law. The decision, issued on July 12, 1955 (Case No. 15, 258) reverses a District Court decision for the Southern District of Iowa that the work of the consulting engineer was too remote from interstate commerce to constitute the type of activity contemplated by the minimum wage and time-and-a-half law (AE, Jan. 1955).

The new decision also is contrary to a ruling of the Federal District Court in Maryland in 1949 that plans, drawings and specifications prepared by a consulting engineer represent only the written embodiment of professional advice, and are incidental to the production of goods or the development of instrumentalities of interstate commerce (AE, March, 1949).

Chief Justice Woodbrough of the Court of Appeals announced the significant opinion in the case of the U. S. Department of Labor v. Kenneth R. Brown of Des Moines, Iowa, doing business as the Brown Engineering Company. The opinion recited that the consulting engineer employs approximately 43 persons, that his work "consists of consultations with clients respecting engineering and architectural problems and the giving of advice and recommendations for the solution thereof." The court noted that the consulting service is performed normally in two phases; first, surveys and introductory investigations, followed by preliminary designs of the construction contemplated, preparation of plans, specifications, drawings, designs and tabulations reflecting in detail the construction work to be performed, estimates of cost, preparation of form of notice and bidding proposal and form of contract between the client and the contractor, and consultation with the client on the construction bid to be accepted. The second phase of the consulting work, the court noted, is the furnishing of inspection service during the construction period, with a resident engineer provided by the consulting engineer to inspect material, check whether the contractor is proceeding according to the plans and specifica-

(*Continued on page 35*)

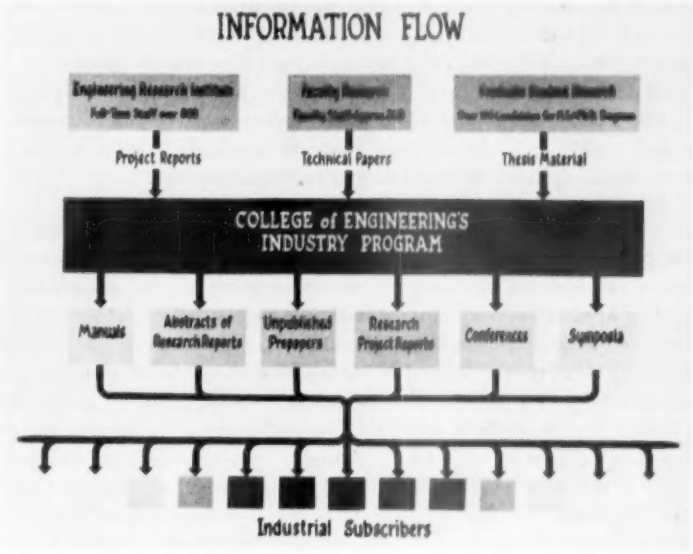
An *American Engineer* SPECIAL REPORT

Re: Michigan's Academic Program for Industry

● A new, fresh approach to the mutual needs of industry and engineering education is being taken at the University of Michigan College of Engineering. Dr. G. G. Brown, Dean of the University's College of Engineering reports the operation of a new program designed to improve the channels of communication between industry and University research in engineering and the physical sciences.

The program is called the University of Michigan College of Engineering Industry Program. Dean Brown points out that its primary purpose—the exchange of ideas and technological information with industry—will enrich the educational and research functions of the University, which are of great importance to industry in supplying ideas and trained personnel. The enrichment will come from the close association of the College staff with the modern industrial requirements of the subscribing industries.

This unique program operates in this manner. An appropriate program representative is appointed by the University from the faculty or research staff. The program representative is generally in the academic field related to the subscriber's industrial activities. Although active participation in the program within the University is on a voluntary basis, the members of each participating department have agreed unanimously to make available all non-proprietary material of possible value to subscribers. The subscriber is likewise requested to designate a representative who will administer and direct the industry's activities in the program. Both representatives will meet periodically at the campus or the subscriber's location to discuss new findings in their mutual fields of interest, and to review in detail recent program releases of particular interest to the subscriber. In addition to these meetings and discussions between representatives, a series of group meetings and symposia will be scheduled at the campus for subscribers. The symposia will include speaker presentations and panel discussions on a variety of current, scientific top ics. The program does not support research projects for specific subscribers, but the services of the Engineering Research Institute, directed by Dr. R. G. Folsom, are usually available for the administration of a sponsored research project.



Since the Engineering College and the Engineering Research Institute of the University of Michigan have vast resources of knowledge in engineering and the physical sciences, a subscriber is assured of obtaining much information covering a wide range of interests. If the potential subscriber decides to enter the program, his organization is immediately eligible for certain past publication releases.

The program is operated on a subscription basis, and the fee to each subscriber is $5,000 a year, contracted for a three-year period. Dean Brown outlines several distinct features of this program: first, the flat subscription rate allows participation by large and small industrial organizations alike, with equal representation; second, the personal contact among technical men with similar fields of interest will stim-

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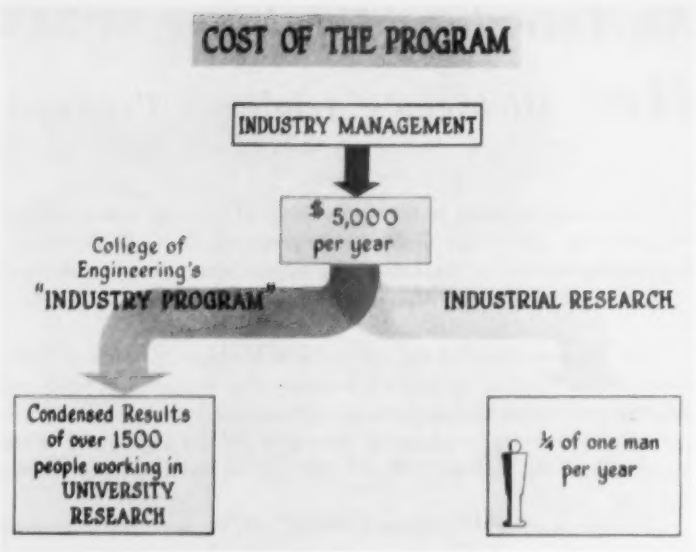
ulate thinking more readily than the mere reading of reports; and third, the program is designed to cover maximum usable information to each subscriber with a minimum of report reading.


COST OF THE PROGRAM
INDUSTRY MANAGEMENT
$ 5,000 per year
College of Engineering's "INDUSTRY PROGRAM"
INDUSTRIAL RESEARCH
Condensed Results of over 1500 people working in UNIVERSITY RESEARCH
¼ of one man per year

Administration of the College of Engineering Industry Program is the responsibility of Harold A. Ohlgren, Professor of Chemical Engineering at the University, and Assistant Director of the Engineering Research Institute. This assures direct coordination with the activities of the Institute. Professor Ohlgren, incidentally, has had 18 years of industrial experience in the fields of chemical processing, radiochemistry, and nuclear energy.

Although the College of Engineering Industry Program has been operating actively for only a few months, the conception and plans for it have a long history in the administrative planning of the College of Engineering. The major efforts of the program staff are presently directed to the task of collecting material for subscribers from some 30,000 to 40,000 pages of reports and technical papers. Since research theses and papers often appear in journals a year or more after the work is completed, the program exhibits one of its most valuable features by accomplishing advance distribution of technical papers to the subscribers. In addition to helping the author in the preparation of manuscripts for early "pre-paper" publication, the program supports technical activities, such as the preparation of literature surveys, the compilation of manuals, and technical editing.

The feature of conveying maximum usable information with a minimum amount of report reading on the part of the subscriber is accomplished in two ways: first, although the subscriber is entitled to any report released, the program staff selects research reports, papers, and theses in which the greatest industrial application is evident; second, one-page abstracts are made of each release and mailed to subscribers for their review. From the abstracts, the subscriber can readily select those reports and data that may be of special interest to his organization. Titles of some materials made available to program subscribers to date include releases such as: "A Peacetime Survey of Nuclear Energy from an Industrial Viewpoint," "Wear Rates of Final-Drive Sun Gear by Radioactive Method," "Utilization of Gross Fission Products," "Welding of Special Materials," "Weighted Mutual Reactances for a Triple-Cage Motor Circuit," "Predetermination of the Sound Pressure Level of Magnetic Noise in Medium Induction Motors," and "Procedure for the Design, Fabrication, and Inspection of Pressure Vessels."

The University of Michigan College of Engineering Industry Program is an endeavor of imagination, much needed in the effective promotion of academic and industrial liaison. Fortunately, the Engineering College and Engineering Research Institute of the University of Michigan have the necessary wealth of research material from which the program can draw. Present engineering research involves the efforts of over 1,000 technical and administrative personnel working in the fields of engineering and the physical sciences. Outstanding work is being done in a number of fields: aerodynamics, electronic computers, high-temperature metallurgy, heat transfer, hydraulics, radiochemistry, to mention just a few. An atomic reactor is now being constructed on the University's new, modern North Campus. New automotive and aeronautical laboratories are under construction there, and new laboratory buildings for research in fluids and low-temperature phenomena are now being designed for the North Campus area. Together, all of these new facilities will accelerate research in many types of engineering and scientific problems. The Industry Program will have firm roots to grow in, and should do much to disseminate and develop scientific knowledge and to implement the graduation of better trained and oriented engineers for industry.

NSPE Before House, Senate Groups on Retirement, UMT Bills

The following testimony was given by NSPE's Executive Director Paul H. Robbins before the House of Representative's Committee on Ways and Means late last month. The legislation in question was the Individual Retirement Act of 1955, H.R. 9 and H.R. 10.

One of the constitutional objectives of the National Society of Professional Engineers is "the advancement of the public welfare and the promotion of the . . . economic interests of the Professional Engineer." In urging the Committee to approve and recommend the principles of H.R. 9 and 10, we believe that both objectives will be advanced.

It is a well settled principle of the American System that thrift is considered a virtue and that each individual should plan early in his career for the inevitable day when the vicissitudes of time will remove him from income-producing work in his major line of endeavor. When that time comes it is expected he will have put aside, in one form or another, the economic means to maintain himself and his dependents in a decent and respectable condition. For a great many of our citizens the path to this goal is eased to a considerable extent by private pension plans under the authority of Federal law.

This opportunity does not exist, however, for the self-employed and those who are not within an approved pension plan. They are denied a practical opportunity to add this layer of retirement protection to their personal portfolio of future economic security arrangements.

The establishment of private retirement plans, paid for out of current earnings, would appear to be the logical resolution of the situation by the self-employed professional. But the harsh fact is that the present high tax rates, which the experts assure us will not be substantially reduced in the foreseeable future, do not leave the average self-employed professional person enough to cover living costs and a residue for the relatively high payments which are required for an acceptable private pension plan.

The pending legislation proposes to recognize these facts and provide a fair and equitable way for the persons thus situated to have the opportunity to provide some degree of retirement security out of their own current earnings. This can be done if the Federal Government is willing that each self-employed individual desiring to do so be permitted to reduce his yearly tax liability by a relatively small percentage in order that this sum may be invested in a retirement program. It is not necessary for our purpose to delve into the details of the legislation because the technical experts in the field of taxation will undoubtedly advise the Committee on that phase of the hearing. In company with representatives of the other major professions we would, however, submit some basic facts and considerations applicable to the professional group within our orbit of interest—the professional engineers.

As is the case with other professions, preparation for a career as a professional engineer is both costly and time-consuming. Costs of an engineering education, in common with the costs of education for other professions, are necessarily high. Institutes, colleges, and universities invest a great deal of money in buildings, equipment, and staff. Many engineering schools are located where costs of living are high. A student embarking upon an engineering career is thus faced with the outlay of a considerable sum of money at a time when others in his age group are beginning to work in gainful employment.

Upon graduation, the young engineer is confronted with the fact that at least four years of supervised professional practice are in most cases necessary before he can be licensed as a full-fledged professional engineer. Without such a license he is ineligible to offer his services to the public. In addition he discovers that this interim period is apt to be prolonged by the fact that he must take time to build himself a reputation sufficient to attract clients, and to gain the additional experience necessary to provide the most efficient service.

For many years the private practitioner must normally be content first, to expend considerable sums of money on his education, and second, to work for a comparatively small income until the time comes when his reputation, prestige, and work permit him to realize a profit on his invested time and money. Thus he arrives at the same peak in his professional life as do the practitioners of other professions, and at approximately the same time. This peak he maintains for some years, only to find that as he grows older his income gradually begins to decline by the time he reaches a normal retirement age. It becomes clear, then, that most consulting engineers cannot, and do not, realize a return on their original investment until they have reached early middle age. It is additionally clear that the period of maximum remuneration which rewards them for their earlier sacrifices is small in terms of the total span of their working years.

From this period of maximum earnings must be provided future retirement income. A self-employed engineer cannot rely on a company pension plan, a government pension, or similar sources of retirement income. What retirement income he has he must provide for himself.

It is possible for salaried employees to receive substantial tax benefits under existing favorable tax law provisions. There is an increasingly general tendency on the part of industry to provide retirement income in addition to social security benefits which may be accrued. Even the proprietor of a non-professional personal service business is less likely to be in a position where he is subject to the effect of surtaxes on a single life-time peak of personal income, and is better able to capitalize on his business in order to secure his retirement. As matters now stand, the professional man only is truly forgotten by the tax laws. He alone stands in a position where high surtaxes prevent him from leveling his earnings to provide a stable income and retirement benefits.

It would appear then, that in all fairness the laws should be written to permit those who earn their income by a personal practice of a profession to project some portion of their earnings into the future for tax purposes. In this way they may escape the present unfair full impact of the existing surtax on their peak earnings, thus being able to establish a secured fund for retirement.

One other consideration should not be lost sight of. Our country today stands in need of all of our trained professional people, and the need for additional trained professionals is daily increasing. Advice and counsel from schools and industry, from Federal Departments, Agencies, and Bureaus encourages our young people to evaluate their future employment and life work not only in terms of services which can be performed, but also in terms of income and future security which can be anticipated from the performance of the services. Is it too much to believe that many young men who might otherwise consider the independent practice of professional engineering could well decide to find work where the financial rewards, and particularly the financial security, are more certain? Can we afford to discourage the independence of thought and effort characteristic of the private practitioner from whose ranks in all the professions much of our leadership has been, and will be, drawn? It seems clear that we can ill-afford to discourage such people from embarking upon professional careers by presenting them with a prospect of rewards not commensurate with the risks they are asked to run.

The National Society of Professional Engineers is confident that the Committee, which has recognized the magnitude and difficulty of the problem by scheduling hearings on this legislation, will unquestionably arrive at a fair and equitable solution to the problem we have discussed.

If we can be of any additional assistance to the Committee in its further deliberations we stand ready at all times to do so.

* * * *

The following testimony was presented by Mr. Robbins before the Senate's Committee on Armed Services last month. The testimony deals with an amendment of the Universal Military Training and Service Act, H.R. 7000.

We are concerned with the problem before this Committee particularly as it affects the relationship of the professional engineers of the nation to the total national defense. While our special competence in this field relates to the contribution of the nation's professional engineers to national defense, we have consistently maintained a Society policy, and repeat it now, that "the total welfare and security of the United States, and not the best interest of any group or individual is the basic consideration for all questions to be resolved. . . . The objective of the engineering profession in time of national stress must be the development of the means to provide a maximum contribution to the military strength of the nation, and the maximum production to support that strength."

The basic facts regarding the nature of modern defense as related to the technology of today and tomorrow are unquestioned. The President of the United States, the Congress and every national leader who has publicly spoken on this point agree that modern techniques of defense require an increasing number of highly competent and trained scientists and engineers, both in the active military service and in the production arsenals which develop and build the modern weapons. In addition, all recognize that continued basic and applied research of increasing complexity is vital to continued strength in our total defense picture. It is also well accepted that the demands of present-day technology require a continued flow of trained students from our universities and colleges.

We do not consider it necessary to labor these points or prove them to this Committee. We are mindful of the statement of this Committee in its report on the extension of the Draft Act (S. Rept. 549, June 14, 1955) wherein it was recognized that the need for engineers and scientists for defense purposes is of a critical nature, following which the Committee strongly urged that immediate steps be taken to educate more scientists and engineers.

This Committee recognizes, we are sure, that any program of expanded numbers of graduates in engineering and science will take considerable time. Even if enrollments could be significantly increased immediately there would be a period of four years before the increased numbers of trained persons would be available to industry and the other users of engineering and scientific talent. This is a minimum period and does not take into account additional time for graduate study which is becoming ever more urgent as technology in general and weapons development and production becomes more complex.

It therefore seems to us that the immediate question involves the ways and means whereby we can most effectively utilize the present supply of engineers and scientists and those who are in our educational institutions as they emerge into the working profession.

The basic problem, as we see it, involves three primary considerations with respect to military service legislation:

1. The Training of Scientists and Engineers for an Indefinite Period.
2. The Continuation of Advanced Research.
3. The Maintenance of Adequate Scientific and Engineering Personnel in Defense-related Industry.

The first two points are related most directly to the statutory provisions and administration of the Draft Act. We have been pleased to note that the student deferment program will continue under the extended Draft Act. We see no special problems in continuing this vital program, without which our future supply of engineers and scientists would be seriously jeopardized.

With respect to advanced research we would only comment at this time that the Selective Service regulations authorize a further deferment after completion of undergraduate study in order that qualified students might continue their study for graduate degrees and research. Unfortunately, there has been some tendency at local Selective Service Board levels to minimize the importance of graduate study. We are hopeful that this attitude is being dispelled. The establishment of engineering and scientific advisory boards to the state Selective Service operations in most of the states will be of immense assistance in this connection.

The remaining point in our discussion—the maintenance of adequate scientific and engineering personnel in defense-related industry—is directly related to the legislation now before you. We should like to discuss several aspects of that problem in relation to the pending bill and offer several suggestions for revision which we feel will contribute to the objective of full utilization of engineering and scientific personnel without restricting the effects of the legislation.

In our judgment the most serious, and perhaps most difficult, problem in balancing military needs for manpower and specialized technical manpower requirements of industry, which must turn out the sinews of modern defense, is the proper relationship with regard to specialized personnel in the military reserve organization and who may be essential to industrial development and production. Under the pending legislation we may anticipate that in the future many, or perhaps most, of the essential technical personnel in industry may be subject to recall to active military duty as part of the Ready or Standby Reserve.

We are pleased to note in the pending bill the provision that the President may prescribe regulations governing the selection of persons with critical skills engaged in critical defense-supporting industries and research who may be allowed, notwithstanding their age at the time they are ordered to report for induction, to fulfill their military obligation by serving for six months on active duty training, to be followed by seven and one-half years of reserve service.

The purpose of this authorization is to reduce the loss in time of critical personnel to defense-supporting industry or research. It is our understanding that such persons, upon completion of their six months of active duty training, would be subject to the screening process and, if qualified, could be transferred to the Standby Reserve. Under the legislation, those in the Standby Reserve, in time of war, or of national emergency declared by Congress, may be ordered to active duty "only after a determination of availability by the Director of Selective Service."

We assume that this language means that the Director of Selective Service would receive the advice of the appropriate local Selective Service Board regarding the critical or essential nature of the work being performed by the individual in the interests of national defense and whether an adequate replacement is available should the individual be recalled to duty. If this understanding is correct, we would suggest that the purpose be clarified. The only standard to be applied in the pending bill is "availability." This may mean many things to the various local Selective Service Boards. We would suggest that the intent of this provision be clarified by providing language and procedure similar to that employed in the case of deferments under the Selective Service Act for reasons of services performed in the interest of the national health, safety and welfare, including the same rights of appeal.

With respect to the standard to be applied in determining transfer to the Standby Reserve, we note that the President is to prescribe regulations to govern the armed forces in the screening process.

Among the criteria prescribed in the bill—"members of the Reserve forces possessing critical civilian skills will not be retained in numbers beyond the requirements for those skills except for persons who have military skills for which there is an overriding requirement. . . ."

We have no disagreement with the idea that the military should have priority for persons with critical skills to the extent of military need for that particular skill. However, without intending to reflect upon the military services in any respect, we suggest that they are not the best agencies to weigh the often-complicated and complex considerations of critical skills in relation to national defense production and research. We feel that from the standpoint of national defense interest it is necessary to have some better qualified mechanism or procedure to establish and monitor basic national policies regarding the essential nature of certain engineering and scientific occupations. It is suggested that this can be accomplished without interfering with

(*Continued on page 28*)

Professional Engineers of North Carolina—Annual Meeting, August 13, 1955, Sedgefield Inn, Greensboro, N. C.

West Virginia Society of Professional Engineers—Annual Meeting, September 22-24, 1955, Fairmont Hotel, Fairmont, W. Va.

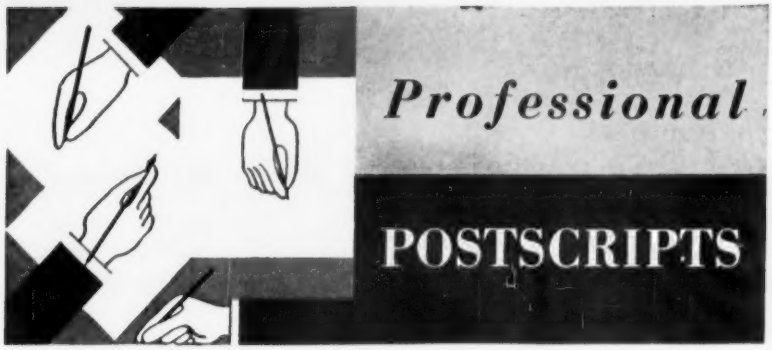
Virginia Society of Professional Engineers — Annual Meeting, October 6-8, 1955, Roanoke Hotel, Roanoke, Virginia.

NSPE Fall Meeting — October 14-15, 1955, Peabody Hotel, Memphis, Tenn.

Missouri Society of Professional Engineers—Annual Meeting, October 21-22, 1955, Kentwood Arms Hotel, Springfield, Missouri.

North Dakota Society of Professional Engineers—Annual Meeting, November 4-5, 1955, Dickinson, North Dakota.

Arkansas Society of Professional Engineers — Annual Meeting, November 18, 1955, Marion Hotel, Little Rock, Arkansas.



Professional POSTSCRIPTS

The primary purpose of —PP— is to give our readers an opportunity to declare their views at somewhat greater length than is afforded by the "Letters to the Editor" feature. This month we use the comments of Don V. Purington, P. E., of Houston, Texas who has some interesting observations to make regarding the profession.

—PP—

With Red Russia reporting more than 250,000 engineering students and Red China more than 75,000 in 1953 as compared to 180,000 in these United States, it appears that all engineers should do some serious thinking about the condition of their profession. Something must be done to preserve our leadership in engineering skill and practice.

It is obvious that the causes of the decline in prestige of the engineering profession have not been clearly defined and fully emphasized to all members of the profession. There may be some who say that engineering prestige has not declined. If it has not, then why should there be difficulty in attracting new candidates to the profession? Why should some sixty per cent of a high school graduating class prefer to enter college seeking training in business administration, and only sixteen per cent seek engineering training?

There was a time when fiction writers like Richard Harding Davis and others chose engineers as heroes for their stories and did much to glamorize the profession. During the past fifty years, however, stories containing engineer heroes have practically disappeared from the book markets and the magazines. The scarcity of jokes and anecdotes about engineers in the public press seems to suggest too much of a prosaic concentration on the technical problems of engineering. Perhaps it would be well for the engineers to consider this quotation from Ella Wheeler Wilcox's poem "Solitude": "Laugh and the world laughs with you, weep and you weep alone." From the concern shown in recent magazines and at engineering meetings, it appears that employers of engineers as well as engineers are already weeping.

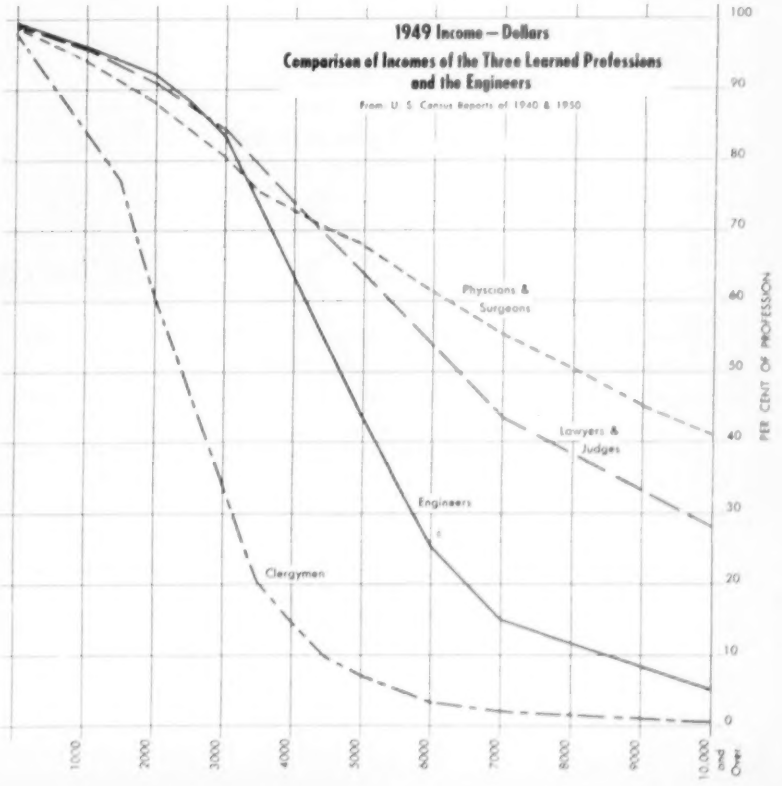
Why? The word why has been the foundation of engineering technology. Why—was the spark that started Galileo, Newton and a host of others to whom the engineering profession is eternally indebted. Now some engineers and writers in the magazines are beginning to use the word "why" about this "shortage" of engineers.

In September 1951, Lawrence P. Lessing in *Fortune* magazine, under the title "A Helluva Shortage of Engineers," discussed the question. Other publications since then have contained many articles on the considered gravity of the situation. College presidents have had much to say about it.

If the numbers of engineers reported by the U. S. Census Bureau from 1910 to 1950 are considered, it would appear that the alarm over the "shortage" of engineers is somewhat late. It is indicated that the total number of engineers declined from 1930 to 1940, but has been increasing since 1940 at the fastest rate in four decades. Only the branch of civil engineering seems to be suffering from an appreciable decrease in numbers. This could be the result of reclassification in other branches as well as actual deflection from the profession. The mechanical and electrical branches are still increasing, but not as rapidly as the chemical, aeronautical, and kindred groups classified as "Other Technical Engineers" in the census reports.

It seems, from the census reports, that the deflections from the practicing professional group, as a whole, are much less alarming than the deflection from the student groups in training to be engineers. However, if the technology of our civilization continues to reduce the ratio between engineers and work-

(*Continued on page 46*)



A+ for ACHIEVEMENT

Do Outstanding Engineering Students Keep on Going Places After They Leave College?

How Do They Prove the Professors Were Correct in Giving Them Top Scholastic Ratings?

R. L. Sweigert, dean of the Graduate Division of the Georgia Institute of Technology, is this month's contributor to the AMERICAN ENGINEER series on outstanding engineering students who have gone on to more than fulfill the early promise they showed during their college days.

Finding it a "practical impossibility" to select just one student for the A+ spotlight because so many of the young men he has known have made outstanding records, Dean Sweigert has turned his attention to a group who studied at Georgia Tech during the mid-forties.

"Perhaps one of the reasons why this group is so well remembered," he writes, "is that its members not only took their bachelor's work here but a good number also continued until they had completed a graduate degree program. It was a group that tended to dig into things: a group that was critical; a group that did some original thinking for itself."

Many in the group went in different directions after completing their academic work, Dean Sweigert reports, but five of them followed through into professional engineering work together and "have made a fine record in that work since leaving the Institute." To these five, Dean Sweigert awards this month's A+. They are: Perry L. Blackshear, Jr., Howard A. Buckner, Jr., Ambrose Ginsburg, Joseph T. Hamrick, and John J. Rebeske, Jr., all now working with the National Advisory Committee for Aeronautics at the Lewis Flight Propulsion Laboratory in Cleveland, Ohio.

Dean Sweigert Comments:

"These men are professional engineers of the highest type. They are engaged in research and have written a number of excellent reports covering this work.

"Mr. Blackshear is a research engineer in combustion. He has performed work in temperature measurement dealing with temperatures at high levels in gases. He has carried on work on combustion resonance involving a study of interaction of standing waves with flames, and is working at present on the hydrodynamic stability of flames and flows allied with flames in ducts. His work has appeared in NACA and ASME publications.

Mr. Blackshear

"Mr. Buckner has been engaged in research in cool-

(Third of a Series)

ing of aircraft engines; has been concerned with cycle analysis work on turbojet, turboprop, bypass, and afterburning engines to determine optimum values of cycle parameters. He has been concerned with research administration and has also carried on an experimental investigation of a ten-stage axial flow compressor. At present he is head of Turbine Aerodynamics, Section A, and engaged in basic aerodynamic research on the turbine components of aircraft engines. He has been active in basic investigations to determine fundamental phenomena in turbine blade passages which result in losses and in research directed at increasing stage work output in order to obtain smaller and lighter turbines for aircraft applications. He has had a number of NACA and engineering society publications.

Mr. Buckner

"Mr. Ginsburg has been engaged in research involving the design of and experimentation on parabolic inducers for centrifugal supercharger impellers. He has also worked on unconventional compressor types to evolve compressors having higher flow and pressure ratio capacity. He has worked on several full scale jet engine compressor research projects and in 1950 was appointed head of the Centrifugal and Supersonic Compressor Research Section. At present he is chief of the Turbine Aerodynamics Branch — NACA Lewis Laboratory. He also has had work published through the NACA and engineering society publications.

Mr. Ginsburg

"Mr. Hamrick has carried on a number of research activities and is now head of the Centrifugal Compressor Research Section. He has engaged in investigations on wet compression; has studied compressible flow through mixed flow impellers and has investigated such items as flow fluctuations at the exit of a radial flow centrifugal impeller. He has studied three dimensional internal flow distribution; and has developed an approximate method for the design of hub-shroud profiles of centrifugal impellers. He has been active in society and community affairs and also has a number of publications to his credit in the NACA and ASME publications.

Mr. Hamrick

"Mr. Rebeske is head of Section B—Turbine Aerodynamic Branch. The work of this section consists of both fundamental and applied research in the field of turbine aerodynamics. He has investigated types of high speed torque meters; a centrifugal compressor operated as a centripetal refrigeration turbine; the characteristics of full-scale high work output, low speed multistate axial-flow turbine for turbojet engines. He has investigated the matching characteristics of multi stage turbines and compressor exit and interstage bleed, etc., on the acceleration characteristics of turbojet engines. Mr. Rebeske has also had a number of NACA and ASME publications.

Mr. Rebeske

"It might be pointed out that these men also have to their credit a number of classified publications because of the nature of their work.

"These men are performing at their highest professional level and are the highest type of professional engineer of the kind that this country so badly needs for both national security and for the advance of peace time purposes. I am glad to be able to give these men some recognition as excellent students and as outstanding professional engineers since they have left the Georgia Institute of Technology."

R. L. Sweigert

Testimony

(Continued from page 24)

the basic principle previously mentioned that the recall of Standby Reservists should remain under the jurisdiction of the Selective Service System. We propose that the pending legislation be amended to add a section establishing a National Engineering and Scientific Personnel Advisory Board, under civilian control, housed and administered in the Office of Defense Mobilization. That agency is ideally fitted to weigh total national defense considerations with its special responsibilities and knowledge in the field of defense-industry operations, stockpiles of essential materials, industrial dispersion, manpower supply and requirements, etc.

This Board should be composed of eminent persons in the engineering and scientific professions, including those experienced in industry, goverment, education and the armed forces. Its function should be to recommend basic national policies with respect to the proper balance between military, industrial and research needs of the nation. The recommended policies of the Board, when approved by the Director of the Office of Defense Mobilization, should be transmitted to the President for promulgation as national policies binding upon Selective Service and the military departments.

The incorporation of such a policy board in the legislation will do much to assure the engineering and scientific community and industry that proper high-level consideration will be given to the delicate, but essential, balance between the two kinds of related national defense activities—armed forces and development and production facilities.

With this important modification, we believe that the pending legislation is as just and sound an approach to the national manpower problem as may be developed at this time under the present uncertain circumstances which prevail. Obviously, some of the problems cannot be appreciated fully at this stage, but the bill does have the advantage of a reasonable degree of flexibility to permit improvements through administration and by Executive Order of the President.

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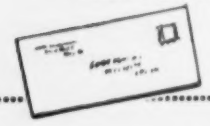
Here is a beautifully colored and practical auto medallion emblem which every professional engineer can display with pride. No bolts or brackets. An adhesive backing cements emblem to trunk lid or other metal surface. Just press on. Leaves no mark on paint when removed. The 3¼-inch emblem bends easily to fit curved paneling. Design finished in maroon, black, white, and chrome. A completely new emblem, it will afford professional recognition with dignity and attractiveness. ORDER YOURS NOW FOR ONLY $1.00.



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Conscientious!

When Ray Rehder, California State Polytechnic College mechanical engineering major from Livermore, Calif., advertised on the college bulletin board that he'd "do anything as part time work," student wife Mrs. John Menlo promptly hired him—as a baby-sitter.

"The kids are putting themselves to bed," she informed Ray on his arrival. "Just make yourself comfortable. If they start acting up, yell and you won't have any trouble."

Some fifteen minutes after the parents' departure, a fully dressed little boy tip-toed carefully out of the bedroom. Ray's "yell" sent him scurrying back. Again the youngster tried it. And again—the baby sitter's irritation mounting.

Finally, the Menlos arrived back home.

"Have any trouble?" Mrs. Menlo asked.

Before Ray could answer, the small boy dashed into the room.

"Auntie! Auntie!" he complained tearfully. "This mean man won't let me go home!"

N.S.P.E. Believes

P.E.'s: TARGETS OF NEW UNION DRIVE

BY PAUL H. ROBBINS, P.E.

Executive Director

N.S.P.E.

IT HAS BECOME more and more accepted by the users of engineering services that engineering talent is most productive when recognition is given to the unique conditions of professional employment. NSPE believes that such recognition is extremely important, not only so that the members of the engineering profession can develop to a maximum degree the scientific potential of our Nation, but also so that their professional stature can be effectively recognized.

The leaders of organized labor have, on many occasions, taken a contrary point of view, contending that all categories of employees have the same common interests. The recent merger of the AFL and CIO and public statements by several labor leaders portend a period of decision in the immediate future for the engineering profession.

A recent issue of the *Council Compass*, publication of the Council of Western Electric Technical Employees (an ESA affiliate) had some interesting observations with respect to the possible developments resulting from the merger of the AF of L and the CIO. The *Council Compass* had this to say:

> "Walter Reuther and George Meany have made public statements indicating that the labor movement must expand in the great mass of unorganized workers. Both labor leaders agree that the first target must be the engineering and scientific employees because of the development of automation and technological improvements which so vitally affect the labor force. How is the organization of professional employees to be accomplished by the new united labor organization? By now the AFL knows that it costs thirty times as much to organize engineers as it does to organize normal employees. The usual organizational techniques used with production and maintenance employees fail miserably with professional employees. Because of this knowledge, the merged CIO and AFL groups intend to follow this four-pronged approach:
>
> "1. The creation of a special division separate and distinct from the production workers for the salaried, professional and technical employees. This division would guarantee autonomous power for the engineering units and would be headed by nationally-known engineers and scientists.
>
> "2. The merged CIO and AFL groups would tighten Section 8(1)(2) to make it legally impossible for engineering groups to form the so-called 'sounding board' groups, such as the General Electric Engineers' Association, Consolidated Engineers' Association, etc. It would force engineering groups no choice but to form a certified union if it wished to discuss matters of mutual interest with management.
>
> "3. Elimination of Sections 2(12) and 9(b)(1) of the Taft-Hartley Act. Without this protection, professional employees could be engulfed by the shop employees whether they like it or not—unless they fight expensive legal battles to form independent unions.
>
> "4. The CIO and AFL groups would point out to the independent unions that the only way to deal with management is not through facts and reason but through the convincing power of force. This force and cooperation would presumably be provided by the united labor movement through cooperation in setting up picket lines, strike funds, etc."

NSPE believes that the future development of engineering as a profession must rest upon a framework supported by three essential elements: (1) The individual engineer must be willing to support professional development by his attitudes, his activities, and his participation in professional and civic affairs; (2) The professional society must provide a vehicle through which he can effectively resolve his problems, and provide an organizational pattern through which his activities will be effective; and (3) The users of engineering services have the responsibility to provide an atmosphere for the maximum professional development of their engineering personnel.

NSPE has been active in developing this three-legged support. Its organizational pattern, its Chapters and States Societies, as well as its National committees, provide an excellent means whereby individual engineers may together resolve their problems.

The months ahead may involve important decisions for all engineers. NSPE believes it is essential that individual engineers approach such decisions keeping the professional viewpoint paramount in their minds and supporting with their time, effort, and energies, those organizations through which the increase in professional stature of the profession will be assured.—***End.***

NEW Processes . . .

Largest Scrubber Made Of Polyethylene

The largest scrubber ever made from polyethylene has been manufactured by the American Agile Corporation, Maple Heights (Cleveland), Ohio, for a large chemical processor. This model measures four feet in diameter, five feet high, with a gas flow of 2,500 cfm at 1½" p.s.i. It will be used in contact with hydrofluoric acid and fluorides.

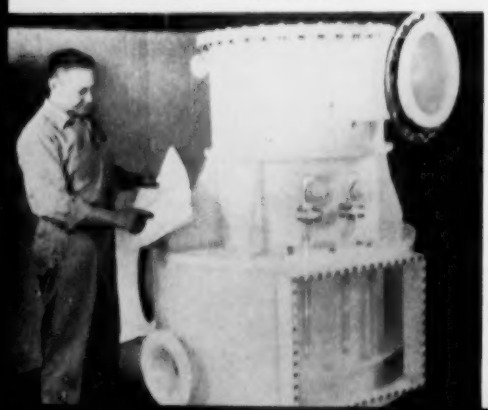
It is often difficult to choose the best material from which to construct chemical processing equipment to handle hydrofluoric acid under 60% concentrations. According to American Agile Corporation, rubber and rubber linings have a limited life because of hardening or embrittlement. Stainless steel, mild carbon steels, aluminum, and other alloys corrode severely. Glass is badly attacked, and some other plastic materials are either economically unfeasible or too brittle for many constructions.

Advantages of polyethylene for such equipment include its excellent impact strength and unbreakability, its desirable low temperature properties, and its excellent chemical resistance at temperatures up to 170° F.

The material itself is eight times lighter than steel and in similar fabrications, averages 1/3 the weight. There is no preferential chemical attack at the welds which are produced by the hot gas welding process, and overall, the equipment is virtually maintenance free.

All of the appurtenances normally required for process equipment such as ducting, piping, valves, centrifugal fans, and tower packing are also available in self supporting fabrications made of polyethylene, and may be easily installed using the hot gas welding process.

Shown below is the largest scrubber ever made of polyethylene.



Thermal Barrier Lifted By Developing New Aluminum Alloy

Research is lifting the thermal barrier that has threatened the use of aluminum in supersonic aircraft of the future, according to Aluminum Company of America.

In lifting the veil on its new patented high temperature aluminum alloy called X2219, Alcoa stated that other pending alloy developments will combine with the current one to effectively raise existing temperature limits on aluminum.

Use of aluminum in supersonic aircraft was jeopardized by elevated temperatures of high speed flight. Friction with air at speeds over 1,000 miles per hour generated intense heat in the skin of an airplane. This heat, combined with that generated by the engine threatened to raise the temperature in some parts beyond the efficient performance level of existing aluminum alloys.

Faced with this problem, Alcoa's Aluminum Research Laboratories were assigned the job of adapting aluminum to high temperature conditions. The first result is today's news of Alcoa alloy X2219, which offers excellent properties at 500 to 600 deg. F. This temperature range is valuable for applications in and near aircraft and automotive engines.

Alcoa's research laboratories expect alloy developments in the near future which will allow excellent properties in the 300 to 400 deg. F. temperature range. This range is valuable for structural use in supersonic aircraft.

Army Tests Corrosion Inhibitors

A five-year investigation of volatile corrosion inhibitors as substitutes for petrolatum-type preservatives in long-term storage of metal parts is described in a recent research report released by the Office of Technical Services, U. S. Department of Commerce.

This experiment was conducted by the Army's Rock Island Arsenal, with ferrous and non-ferrous ordnance items stored in three petrolatum-type preservatives or wrapped in papers impregnated with two volatile inhibitors.

Test results and preservative compounds are fully described in this 31-page report, which includes an analysis of the inhibitor content of the paper wrappings at the end of the 5-year period.

The report is available from OTS, U. S. Department of Commerce, Washington 25, D. C., for $1. Order PB 111608. *The Use of Volatile Inhibitors as a Preservative Medium For Long Term Storage of Ordnance Material—Addendum IV — Results after Five Years of Exposure.*

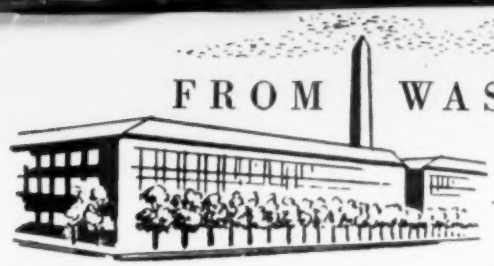
New Plastic Overlay Perfected For Plywood

Something new has been added to make plywood more practical for outdoor construction. It's a plastic overlay on plywood, developed by Crown Zellerbach, San Francisco, after years of research and extensive field tests —and dubbed the "million dollar sandwich."

Crezon, the maker's trade name for the new plastic surfacing material, is an overlay sheet of phenolic resins and cellulose fibers, made by combining wood fiber with a phenolic resin developed especially for this product. The mixture is pressed to a thickness of 0.014 inch and a phenolic glueline is added. The overlay is then wound into rolls for shipment to plywood mills. At the plywood mill, the individual wood plies of exterior-grade Douglas Fir plywood and the Crezon overlay all go into the giant, hot presses together. The plastic surface, under intense heat and pressure, is fused to the plywood which, in the finished form, is called Crezon Fused Plywood.

Among the advantages in using Crezon Fused Plywood, the company reports, are: resists checking, even under extreme weather conditions; takes paint smoothly and holds it; saws without splintering; drills perfectly with a punched out neatness; plowing and dadoing are simplified, the cut is so clean only a touch of standpaper is needed; routing is clean, the Crezon surface prevents splitting out; shaping is easy, the overlay prevents splintering of either surface; and sharp smooth cuts are possible by jointing and edge planing.

Because of its plastic surface, Crezon Fused Plywood is highly recommended for interior use, too, especially in kitchens, bathrooms and laundries.



FROM WASHINGTON

By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

FEDERAL DESIGN AND CONSTRUCTION SERVICES

Should the Federal Government provide its own engineering and architectural services?

This long-standing question has received a forceful negative answer from an eight-man Task Force of the Hoover Commission. The group, including four members with engineering backgrounds, made an intensive study of real property management in the Federal structure and devoted a chapter of their report to an analysis of Federal design and construction services.

One of the major conclusions of the study group was:

"That the Federal design and construction organizations (a) retain in their own organizations only the personnel required for preliminary study, preplanning and budgeting, and essential supervisory management and control, and (b) contract to private architect-engineering and construction firms design and supervision of construction to the maximum extent consistent with national security."

The Hoover Commission itself, as distinguished from its Task Force, did not comment directly on this recommendation in transmitting its real property management report to Congress. It did list, however, the estimate of the study group that "wholehearted implementation" of the recommendation would result in an annual savings to the Government of more than $100,000,000 annually.

In a detailed analysis of the comparative cost of Federal agency design and construction services, the Task Force published the following illuminating statistics:

Organization and source of data (Dollars in millions)	Estimated cost of active projects[1]	Total present engineering and construction staff employees	Service cost (percent of construction cost)
Atomic Energy Commission (119 current projects)	$4,292	448	5.23
General Services Administration (22 projects)	94	533[2]	6.71
Navy—Bureau of Yards and Docks, fiscal year 1954	352	2,627	8.17
Army—Corps of Engineers:			
Military work (including work for Air Force)	1,145	8,467[3]	10.75
Civil work, fiscal year 1954	423	9,130[3]	12.15
Air Force—independent of Engineer Corps (under construction September 1954)	762	([4])	([4])
Tennessee Valley Authority (4 projects)	245	1,774[5]	16.7
Veterans Administration:			
Fiscal year 1947-54 inclusive	310		10.09
Fiscal year 1954 (including above)	17	499	17.8
Bureau of Reclamation, Department of the Interior (estimates of 15 projects)	670	6,300[5]	17.0

[1]For projects included in this study, except where noted as fiscal year expenditures.

[2]On new construction and maintenance.

[3]This figure excludes all personnel in the Office of Comptroller, personnel office, service of supply, real estate, and legal.

[4]Not available.

[5]This figure includes personnel in the offices listed in note 3 who service design and construction.

The study group offered the following comments about the design and construction activities of the major Federal Agencies in the field:

Atomic Energy Commission—" . . . has the most efficient design and construction organization and procedures of all the Government agencies. AEC takes full advantage of the services of private

(Please turn the page)

(Continued from previous page)

architect-engineer and construction organizations by contracting all phases of its design and construction work."

Tennessee Valley Authority—" . . . the only Federal organization of the eight under consideration which does not use the services of private engineering-construction organizations. Its costs for engineering and construction services are abnormally high."

Corps of Engineers, Army—"The principal reasons for (their) high cost, none of which reflects on the professional ability and responsibility of the top command of the Engineers Corps are: . . . sheer magnitude and extent of design and construction . . . rigidity of command inherent in military control . . . frequent rotation of officers . . . except in the most general phases of business administration, civil works do not provide essential military training."

Bureau of Yards and Docks, Navy—" . . . a simpler and more compact organization . . . cost of its engineering and construction service . . . is substantially lower than that of the Corps of Engineers and on a smaller volume of work."

Air Force—No substantive comment offered as the Corps of Engineers handles the greatest part of the Air Force construction program.

Bureau of Reclamation—" . . . well organized and competently staffed . . . cost of engineering and construction services in terms of construction cost . . . unduly high, probably close to 17 per cent . . . overstaffed in relation to current funds available . . . reduction of staff would release personnel currently in demand by private industry."

General Services Administration—" . . . satisfactory costs, based on the standards for commercial construction and repair projects . . . design work executed by the Office of the Commissioner of Public Buildings Service is well planned and well executed . . . policy of engaging private architectural firms for large and important projects . . . contributes to the efficiency and economy of its operations."

Veterans Administration; Hospital Design and Construction—" . . . design and construction staff . . . considerably larger than is needed . . . " Design and Construction Division, General Services Administration, is the proper unit to control the design of all permanent Federal public buildings, including hospitals.

The above extracted comments provide the backdrop for the Task Force's conclusions on the question of Government v. private design and construction services. The following first three paragraphs in full indicate the general flavor of the analysis:

"The cost to the Government of its design and construction activities is abnormally high and out of line with the cost of similar work in private industry. This results from having so many offices independently engaged in architectural and engineering work; from overstaffed, permanently retained technical groups; from the many different standards and management practices; and from the absence of operating data which would provide a means of comparing the effectiveness of the numerous Federal design and engineering organizations.

"Private architect-engineer and construction organizations are geared to a broad base of diversified work and to the efficiency and flexibility of large scale competitive construction activities. In times of peace and of national emergency, they have effectively and efficiently met the demands of the Government on Federal construction projects, as well as the demands of industry for private construction.

"By contracting to private architect-engineer and construction organizations all phases of design and construction work on Government construction projects, relatively small supervisory engineering organizations in the executive agencies could furnish the preliminary study, preplanning and budgeting, and the supervisory management and control essential for all Government projects, without maintaining through periods of fluctuating demands the present costly overhead for complete engineering and construction staffs. With minor exceptions, the AEC has been operating under such a program. If other Federal agencies could attain the operating efficiency of the AEC, the savings to the Government in just the cost of design and supervision of construction, on the basis of present volume of business, would be more than $100 million annually."

A further significant recommendation of the Task Force is that a Coordinator of Public Works be appointed, to be responsible directly to the President. President Eisenhower in his State of the Union Message on January 7, 1955, indicated that he would ask Congress to establish the Office of Coordinator of Public Works. The Coordinator, according to the Task Force, should establish policies, procedures, and standards for the engineering design and construction phases of Federal real property management, and should develop a general policy for maximum utilization of private engineering and construction organization for the execution of civil and public works. Additional specific responsibilities are recommended by the Task Force, the total sum of which would make the Coordinator a virtual "czar" of Federal Public Works, or, at least, the Government's most powerful voice in Public Works affairs.

For those interested in the role of the Federal Government in public works design, construction and administration—the "Task Force Report on Real Property Management," available from the Superintendent of Documents, Washington 25, D. C., at 45 cents per copy, is "must" reading.

NSPE Committee Organization 1955-56

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Hqs. Building Progress . . .

So that members may note the progress that is being made on the new National Society Headquarters Building, the AMERICAN ENGINEER will bring its readers a "Construction Report" from time to time to keep all informed of construction progress. A most recent report indicates that construction schedules are being met with the first floor now poured (see cut) and successive floors to emerge at three-week intervals.

For those interested in a financial stake in the Society's new Headquarters Building, officials urge promptness in placing subscriptions for Building Fund Participation Certificates, which are still available in unlimited amounts to the membership, affiliated state societies and chapters. About $100,000 must still be raised to complete the underwriting of this most important project. ***To obtain a subscription form or Offering Circular which sets forth the details of the financing of the Headquarters Building, a note to the Washington office will bring the desired information.***

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Iowa Case

(*Continued from page 20*)

tions, make estimates of the progress of construction and report computations with respect to percentage payments to the contractor.

Applying duties of the nature described to the operations of the consulting engineer during the period from 1950 to 1953, the Appeals Court listed four cases of work which it said involved instrumentalities of commerce and the production of goods for commerce. These were: plans and specifications for the paving of approximately 37 sections of existing streets in four Iowa towns—"Interstate commerce moved over all of these streets both before and after paving"; plans and specifications for enlarging a power plant and for making other additions to existing equipment of an in-

(*Continued on page 49*)

With Our Members . . .

Connecticut News

New Officers Plan Active Year For Connecticut Society Members

New officers and directors of the Connecticut Society of Professional Engineers took over the Society's administration and officiated at their first board meeting recently in New Haven.

E. J. Nesbitt of Westport, outgoing president, turned the meeting over to his successor, Arthur Bruce Onderdonck of Glastonbury, after first reporting on the past year's activities and accomplishments.

Mr. Onderdonck outlined the objectives for the Connecticut organization for the coming year. He announced plans for an accelerated membership drive to acquaint all Connecticut engineers with the benefits of CSPE membership. And he also stated that the meeting programs throughout the year would be devoted to topics of immediate interest to the members as an incentive to improved attendance.

"The engineering profession is continually growing in importance to modern life," Mr. Onderdonck said, "and only by active participation in the work of the Society can the individual engineer keep abreast of all developments. Consistent dissemination of information on these developments and the work of engineers is also essential in order that the public understand our aims and our progress in their behalf."

In addition to Mr. Onderdonck, who is a consulting engineer, the other new officers of the Connecticut Society are: Theodore Braaten of Norwich, first vice president; Louis A. Warner, Cheshire, second vice president; Ernest D. Mortenson, Stratford, third vice president; Clarence W. Welti, Rockville, secretary; and Edwin S. Osteyee, Stratford, treasurer.

Summer Outings Appear On Many P.E. Agendas

As usual, the 1956 summer season has found many chapters and state societies making plans for picnics, golfing parties, and other summertime social activities in place of formal business and professional meetings.

The Toledo, North Central, and Cleveland Chapters of the Ohio Society were among those scheduling golfing events during June and July. In addition, the Cleveland group has a second day of golf scheduled for September 15th.

Cleveland P.E.'s also included a family picnic in their summer schedule during June. Other chapters who have held family picnics include the Sabine Chapter of the Texas Society, the Franklin County Chapter of the Ohio SPE, and the Engineers' Club of Jefferson City, a component of the Missouri SPE. The Central Illinois Chapter of the ISPE is one of the many local groups with a picnic on the agenda for August.

Tulsa Members Hear Editor

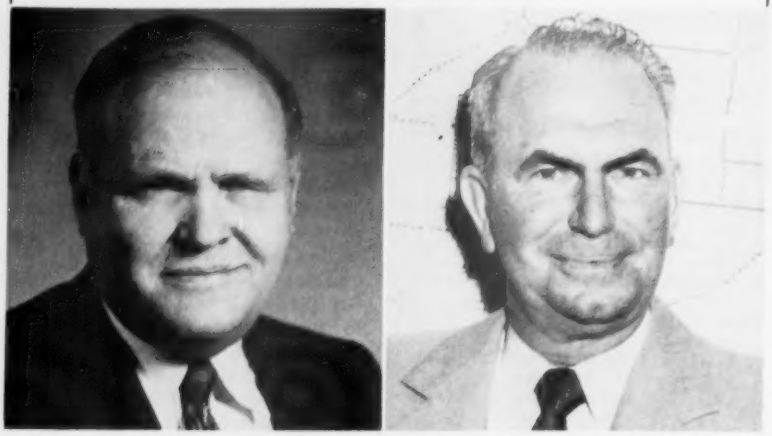
Edward Spillman, State Editor of the *Tulsa Tribune*, was the guest speaker at a recent meeting of the Tulsa Chapter of the Oklahoma Society of Professional Engineers. His subject was *What Does the Indianapolis 500 Prove?*

Recognition Is Topic

J. B. Converse, a consulting engineer of Mobile, Alabama, was the featured speaker at a recently reported meeting of the Birmingham District Chapter of the Alabama SPE. Mr. Converse, who is a former member of the Alabama Board of Registration for Professional Engineers and Land Surveyors, spoke on the subject, *Proper Recognition for the Engineering Profession.*

The meeting was held at the Bankhead Hotel and the evening's program included a dinner and social hour for the P.E.'s and their guests.

NSPE Men in the News



Shown above are two prominent NSPE members who recently made the headlines because of their accomplishments. At the left is Verne Ketchum of Portland, Oregon, who was honored by Michigan State College for his contributions to the profession. At the right is Walter G. Johnson of Topeka, Kansas, new chief engineer of the Kansas State Highway Commission. (For the full story on each see this month's Professional News in Capsule Form.)

Students Are Concern Of Monroe Chapter

Members of the E.I.T. Committee of the Monroe Chapter of the New York State SPE have worked during the past year with local representatives of the American Society of Mechanical Engineers and the American Institute of Chemical Engineers to plan a program for the instruction of undergraduate engineering students at the University of Rochester. The program consisted of a series of talks designed to improve the students' concepts of engineering activity in industry and to help acquaint them with professional attitudes and responsibilities.

Because of the success of the program in its initial year, it is hoped that it can be expanded during the coming year and that it will eventually become a permanent joint project of the societies involved.

New Franklin County Officers Are Named

The Franklin County Chapter of the Ohio Society of Professional Engineers has announced the names of the group's newly-elected officers for the 1955-56 administrative term. They are: C. E. Busch, president; Roger W. Loveless, vice president; Edward J. Schaefer, secretary; and T. L. Wallace, treasurer. A. G. Cochran, Fred W. Kimble, and Kenneth E. Winegardner have been named directors-at-large. Frank M. Williams is immediate past president.

Functional directors and their assignments are: Frank W. Turner, county engineers; William E. Buerk, consulting engineers; Charles E. Rarey, engineers in industry; A. J. Friemoth, state engineers; Richard B. Vaughn, public utility engineers; Harold D. Hoyman, municipal engineers; Leon W. Rupp, junior engineers; and Kenneth W. Cosens, Ohio State University. Mrs. C. K. Rose has been named as functional director of the Ladies' Auxiliary to the chapter.

Pletta Addresses Blacksburg Engineers

Dan H. Pletta, head of the Department of Applied Mechanics at the Virginia Polytechnic Institute addressed a recent meeting of the Blacksburg Chapter of the Virginia SPE on the subject, *The Engineering Curricula of the Future*. In his talk, he outlined plans for a curriculum which would include the sciences fundamental to all engineering design. The plan Mr. Pletta described represents a part of the final report of the Committee on Evaluation of Engineering Education of the American Society for Engineering Education.

Carl R. Delagrange, chapter president, also reported on his attendance at the NSPE Annual Meeting in Philadelphia.

All non-member P.E.'s and E.I.T.'s in the Blacksburg area were invited to the meeting as guests of the chapter by Harry A. Wall, Membership Committee chairman.

Fresno P.E.'s Contribute Books To India

The Fresno Chapter of the California Society of Professional Engineers has contributed $100 for the purchase of new engineering books for the University of Delhi in India.

W. Samuel Belden, president of the chapter, said the money was made available to help the cause of international understanding and cooperation. The contribution is part of a larger program sponsored by the International Friendship Council of Fresno, an organization which was established recently to promote international cooperation through the efforts of local citizens.

The program for enlarging the library at the University of Delhi through the contribution of new books and magazine subscriptions is the first project of the Friendship Council. Charles H. Sorter, a member of the Fresno Chapter, the California SPE and NSPE, is chairman of the friendship group.

Arizona Annual Meeting

The Annual Meeting of the Arizona Society of Professional Engineers was held late in June in Tucson, with members of the Southern Chapter making the meeting arrangements and acting as hosts.

The meeting was a day-long event with both professional and social sessions. Charles J. Farrington, public relations director of the Shamrock Dairy, Tucson, and a former Washington representative of the National Coal Producers and the National Automobile Dealers, was the featured speaker at the luncheon.

Officers from both the State Society and the Southern, Eastern, and Central Chapters were present at the evening banquet and were introduced to the membership during the program, which included the State Society installation.

Investment Lecture For Illinois P.E.'s

How to Develop a Personal Investment Program was the subject of a lecture given before the members of the Central Illinois Chapter of the ISPE by Don Radcliffe at a recent meeting. Mr. Radcliffe is the Decatur area representative of the A. C. Allyn Company, investment brokers.

Toll Road Is Discussed

Harold K. Vanderipe, civil engineer with the Portland Cement Association, was the featured speaker at the year's last formal meeting of the Maumee Valley Chapter of the Ohio SPE. Mr. Vanderipe discussed the Indiana Toll Road.

The meeting was held at the Eagles Hall in Paulding, Ohio. Daniel Stouffer and Paul Sutton were in charge of meeting arrangements.

. . . more news on page 11

A PRESIDENT REPORTS — The photo at the right shows Carl R. Delagrange, standing, president of the Blacksburg Chapter of the Virginia SPE, as he reports on the NSPE Annual Meeting to members of his chapter (see story above). J. B. Dent, seated, chapter secretary-treasurer, takes notes on the president's report.

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Hudson County Chapter Announces New Officers

Members of the Hudson County Chapter of the New Jersey Society of Professional Engineers have recently elected and installed new officers for the 1955-56 administrative term. They are: Jeremiah Roach, president; Nicholas F. Perrin, first vice president; William C. Farmer, second vice president; Leonard Mayo, secretary; Bernard M. Schmitter, treasurer; Peter J. McNamara, financial secretary; Ambrose J. Gegan, Jr., recording secretary; and Stephen H. Harnett, state trustee.

Ladies Night In California

The annual Ladies Night Meeting and banquet was held recently in Modesto, California, for the members of the Stanislaus Chapter, their wives, and guests. The principal feature of the program was an illustrated lecture on foreign travel given by Lawrence Robinson, Sr.

Prior to the banquet, a brief report on the recent state convention was made by Fred Johnson, the new CSPE president.

. . . more news on page 42

With the Ladies

Pictured above are officers of the Ladies Auxiliary to the Panhandle Chapter of the Texas SPE. Seated, left to right, are: Mrs. O. L. Johnson, president; Mrs. J. Alton Miller, first vice president; Mrs. H. O. Hodson, parliamentarian; and Mrs. Robert McClure, secretary. Mrs. W. A. Cummins, treasurer, is standing.

Other officers, not present when the picture was taken, are: Mrs. W. R. Bradley, second vice president; Mrs. E. W. Robinson, historian; and Mrs. Jack D. Jones, publicity chairman.

American Motors Plant Inspected By Engineers

Members of the Lake County Chapter of the Illinois Society of Professional Engineers recently spent an afternoon touring the Kenosha, Wisconsin plant of the American Motors Corporation.

Following the tour, an evening dinner meeting was held at the Hanks Supper Club, Waukegan, and the engineers and their guests heard C. E. Pflug, chief plant engineer of the Kenosha facility, as the main speaker. A sound and color motion picture on the American Motors production process was also shown as a supplement to Mr. Pflug's lecture.

Plant Tours For San Jose P.E.'s

Members of the San Jose Chapter of the California Society met on July 12 at Ramor Oaks in Atherton for a summer dinner meeting; and following the dinner, they proceeded to the Ampex Corporation plant in Redwood City for an inspection tour.

The Ampex Corporation manufactures high fidelity type recorders which are used extensively by radio and TV stations, by the movie industry for such processes as Cinerama and CinemaScope, and by research scientists for the recording of such complicated data as that related to atomic bomb tests or experimental aircraft flights.

For their August 9th meeting, the San Jose engineers plan to visit the Underwriters Laboratory at Santa Clara. Charles Brooke, service engineer for the laboratory, will conduct them through the plant and explain some of the experiments being carried out there.

South American Trip Is Described In Talk

Ray Light of the National Mine Service, Beckley, West Virginia, was the guest speaker at a recent meeting of the Appalachian Chapter of the West Virginia Society of Professional Engineers. The meeting was held in Beckley, and Mr. Light described an extensive trip through the metal mining districts of South America for the assembled P.E.'s and their guests.

The lecture was supplemented with a series of colored slides showing engineers—including many United States and European supervisors—at work in South America.

Have you checked these in the Classified section?

- √ **Business Opportunities**
- √ **Help Wanted**
- √ **Positions Wanted**
- √ **Training Courses**

Check Classified, page 47.

Defense

(*Continued from page 14*)

institutions are state supported, the others privately supported. Some of the state supported institutions are financed with reasonable adequacy, most of them, however, except in the North and Middle West, are being starved by small state appropriations, while the privately supported institutions are in a truly deplorable condition financially. The reasons for this are almost self-evident. Since 1940 practically everything that the colleges buy, from lead pencils to cyclotrons, has doubled in price. The returns from the investments which constitute their endowments have been almost halved. We accordingly have a ratio of operation which is four to one more difficult than some fifteen years ago. The colleges are unable to pay their professors much more than a living wage. In fact, some professors with large families are unable to buy their own product; that is, they are hard put to provide their sons and daughters with a college education. Moreover, they see their graduates, because of the demand for engineers, going out into industry at a beginning salary almost equivalent to the regular earnings of the professor who graduated them. This is indeed an anomaly.

We smugly consider that our scientists and engineers are better educated than the Russians. How we arrive at this conclusion is rather remarkable. The colleges are losing their best and most creative minds to industry, and the college pattern is losing its effectiveness in many ways. College people are being harassed with charges of being communistically inclined, and are being forced to sign loyalty oaths and security questionnaires which trench on the freedom and mental serenity of the individual. Professors are frequently regarded in the community as nice but futile people who are to be tolerated for the sake of threadbare intellectual accomplishments that have no practical utilization.

The colleges would probably not admit it, but the quality of instruction today is not as good as it was ten years ago. Ten years hence it will be still less adequate, unless some steps are taken to improve conditions. The future does not promise improvement. The great increase in the younger population is now engulfing the grade schools and by 1970, unless something is done to limit college admissions, it will have

(*Continued on page 44*)

STRICTLY BUSINESS

Personalities . . . **Arthur B. Warner** has been promoted to chief engineer for **Minnesota Rubber and Gasket Company,** Minneapolis, according to the firm's president, **Paul T. Dennison** . . . . **DeLeuw, Cather & Company,** Chicago consulting engineers, have announced that **Richard T. Cash,** formerly with the Illinois Division of Highways, has joined their organization. . . . The **Evans Electrical Construction Company,** Kansas City, Mo., has announced that **Robert F. Johnson** has been elected vice president of the firm. . . . **E. H. Krieg,** a **Stone & Webster Engineering Corporation** consulting engineer and specialist in the steam power field, has been transferred to the company's New York City offices from Boston. . . . **Charles H. Weaver** has been elected a vice president of the **Westinghouse Electric Corporation,** Pittsburgh, with responsibility for all Westinghouse atomic power activities. **V. B. Baker** has been appointed to the newly created position of assistant engineering manager, executive department, East Pittsburgh Division of Westinghouse. **D. R. Tashjian** has been appointed manager of engineering for the corporation's Electronics Division in Baltimore. . . . **Ralph J. Eschborn** has been named chief engineer of **Jack & Heintz, Inc.,** Cleveland, designers and manufacturers of electric systems and components for aircraft.

Mr. Warner

Carl E. Christenson, formerly president and general manager of **Charles E. Christenson & Sons,** Jersey City, has been appointed to represent the **Baltimore Contractors, Inc.,** in the latter organization's newly-opened office in New York City; also serving in the new office will be **Edmund J. Naughton.** . . . The promotion of **Bruno E. Prevost** to the position of company vice president in charge of manufacturing and the accession to the newly created position of company chief engineer by **Ralph L. Draper** have been announced by **John W. Bolton & Sons, Inc.,** Lawrence, Mass., manufacturers of paper mill equipment. . . . The appointment of **Thomas DeLutis** as chief wire and cable engineer at **National Electric Products Corporation** has been announced by the Pittsburgh firm. . . . **Donald Grey Wilson,** formerly chairman of the Department of Electrical Engineering, University of Kansas, has been appointed assistant director of research at **Stromberg-Carlson Company,** Rochester, N. Y., according to **Lynn C. Holmes,** director of research for the firm which has recently merged with **General Dynamics Corporation** as a new division of the latter.

Mr. Prevost

John R. Moore and **Dr. Robert M. Ashby** have been appointed to the positions of director and assistant director, respectively, of the Electro-Mechanical Engineering Department, **North American Aviation, Inc.,** Los Angeles, Calif. . . . **Frederick A. Fielder** has been named assistant to the general manager of **Loewy Construction Co., Inc.,** New York, according to **Erwin Loewy,** president of the parent company, **Hydropress, Inc.** . . . **Arthur Townhill** has joined the **Harwill Corporation,** Los Angeles die-casting firm as director of engineering, according to President **R. C. Clevering.** . . . **Richard Hodgson** has been elected a vice president of **Fairchild Camera and Instrument Corporation,** Syosset, N. Y., and at the same time has been promoted to general manager of the company's Reconnaissance Systems Division. . . . **Edward P. Gebhard** has been named technical director of the Defense Products Division of **The M. W. Kellogg Company** with headquarters at the firm's Jersey City plant. . . . **Vernon R. Degner** has joined **Barry Controls Incorporated,** Watertown, Mass., as a section engineer, according to **Charles E. Crede,** vice president in charge of engineering. . . . **G. Allen Lovell** has been elected a vice president of **United States Rubber Co.** and appointed general manager of its mechanical goods division.

New Firms . . . Announcement has been made of the establishment of the **Smith and Norrington Engineering Corporation,** Engineers and Constructors, in Boston, Mass. The new firm will specialize in engineering and construction of Standby & Peak Shaving L P gas plants, natural gas distribution facilities, polymerization process plants, water works, and other facilities. **Walter L. Norrington** is president of the corporation, while **Irving B. Smith** is vice president and treasurer. . . . **Frank N. Piasecki** has announced the formation of a new firm, the **Piasecki Aircraft Corporation,** Philadelphia, of which he will be president, while **James J. Davis,** Philadelphia attorney, will serve as secretary. The new company will be engaged primarily in the development of new aeronautical products, according to Mr. Piasecki's announcement. . . . **Albert F. Sperry,** president of **Panellit, Inc.,** Skokie, Ill., has announced the formation of a Canadain affiliate, **Panellit of Canada, Ltd.,** in Toronto. **T. A. Hislop** is chief engineer of the new facility.

Changes of Ownership . . . **Thompson Products, Inc.,** Cleveland, O., manufacturer of aircraft, electronic, and automotive parts, has announced the acquisition by stock purchase of **Karl-Douglas Associates, Inc.,** designers and manufacturers of hydraulic and pneumatic cylinders and valves. Karl-Douglas will retain its identity and present plant location in Hawthorne, Calif., operating as a division of Thompson Products' West Coast plant. . . . The **Vulcan Crucible Steel Co.,** Aliquippa, Pa., tool steel manufacturers, has been purchased by **H. K. Porter Company, Inc.,** Pittsburgh, according to an announcement by Porter's president, **T. M. Evans.** The purchased firm now becomes the twelfth Porter division; and **James O. Flower,** the concern's president, will now be vice president and general manager of the new division.

Defense

(*Continued from page 42*)

increased college enrollment by, perhaps, 75 per cent. In Russia, continually greater assistance is being given to mathematics and the rudimentary sciences in the secondary schools. This helps prepare the pupils for further education as engineers and scientists. In our preparatory schools there is a great dearth of such instruction. One evidence of this is that the number of college students completing school teaching certificate requirements in science and mathematics in 1954 showed a major decline from 1949. Mathematics was down 50.6 per cent and the other scientific studies were down 56 per cent. This means that high school students will come to college less well prepared than ever for engineering and scientific courses, and that the faculty to teach them in college will probably be not only over-worked, but also deteriorated. We have not forgotten that some constructive idea should be provided along with any criticism of existing conditions. One suggestion would set up a form of fellowships to attract mathematics and science teachers to secondary and preparatory schools. College graduates who took positions as teachers in these subjects might have their salaries supplemented for three years at $1,000 a year. At the end of three years' teaching, they could be given a fellowship worth $4,000 a year for work in the graduate schools of any university they might select. During that period they would do no teaching. At the end of three years, most would have attained the Ph.D. degree, and would be available as instructors for other colleges.

The greatest single problem of a young man taking up teaching as a profession is that he cannot attain the highest ranks in college unless he has an advanced degree. The time and expense involved in getting this degree form a tremendous obstacle which most have great difficulty in surmounting. If he knew that by teaching in the secondary school for three years, perhaps even without any supplement, he would be enabled thereafter to pursue his scientific studies, and that accordingly he would have no handicaps to his promotion in the teaching profession, assuming he had the ability, he would be greatly attracted.

If we had an additional 10,000 experienced men under thirty available for the faculties of engineering colleges and the scientific departments of the universities, it would strengthen these faculties tremendously. We would have, say, 12,000 men teaching in secondary schools, each receiving a supplement of $1,000 apiece for three years. We would have perhaps 10,000 of them receiving a fellowship of $4,000 per year for three years; so the investment in each of the 10,000 would be $15,000. To produce this 10,000 we would have an annual cost of $156 million, which is substantially less than the cost of one aircraft carrier. This plan would not only help to improve the quality of students entering colleges, but would, over a period of years, supplement, stimulate, and improve the faculties of our colleges and grade schools, and while the figure 10,000 is used—it could well be expanded by multiples of that figure.

Of the 1800 colleges in the country, perhaps between one and two hundred have sizeable graduate schools capable of conferring sound doctoral degrees in engineering and science. These constitute the actual sources from which future generations of scientists will come. Such graduate schools cannot be established overnight, regardless of the amount of money made available. It would be well to nurture and expand the schools that have already proven their worth.

The graduate schools, which are producing scientists and top level engineers, must carry on research to educate their charges properly. No amount of course work from texts can substitute for actual experience in conducting or helping to conduct experimental work along the frontiers of scientific knowledge. The laboratories where research can be done are quite expensive, and the students must work singly or in small groups. They require the guidance of more experienced faculty members. This thesis guidance, or direction of non-thesis experimentation, demands time and thought of a large number of able professors, each teaching a small number of students. There also exist requirements for specialized equipment and supplies which are frequently costly. All of this adds up to the fact that graduate work is the most expensive type of university education. The colleges have recognized the paramount importance of turning out a larger number of well educated Ph.D.'s, and have striven mightily against great handicaps, but the iron pressure of inadequate budgets has forced them into many compromises. They have accordingly welcomed the opportunity to obtain sponsored research where all, or part, at least, of the cost can be earned by their own efforts.

Industry has begun to place more research contracts with the colleges, even though it fears to lose some patent benefits thereby. By and large, however, industry is not much interested in basic research which, of its nature, offers little prospect for producing an immediate profit. Another aspect of the *quid pro quo* is the concentration of such work in those colleges which are already well supplied, and even the major utilization of the half dozen or so which are actually surfeited at present. There is no doubt that these favored few have great abilities to produce results for their clients, but what we are dealing with here is the education of graduate students.

Although the distribution of research contracts by the Federal Government is more widespread, it, too, tends to favor the stronger and larger institutions so the concentration of research is accentuated. Most of the Federal Government research is done by the armed services, and far too little of this is devoted to basic research, and far too much to the production of weapons. The latter is vitally important, but can well be done by industry; but due to its whole philosophy, industry finds it difficult to continue for years the search for knowledge for its own sake, without being concerned with the financial return. The University, on the other hand, offers an ideal climate for the propagation of basic research.

There were great hopes that the National Science Foundation might solve the twin problems of over-centralization and the preponderance of applied research over basic, however, the motors of the Foundation have never received enough financial fuel to get the craft off the ground. Why this is so remains a mystery.

We have dealt at some length with the fact that our survival may depend upon the success of our graduate schools in producing able young engineers and scientists. We

AUGUST MEETINGS Of Note

American Institute of Electrical Engineers—Pacific General Meeting, August 15-19, Butte, Montana.

University of Wisconsin — Conference on "The Computing Laboratory in the University," August 17-19, University Campus, Madison, Wisconsin.

have just noted that research and experimentation is an absolutely necessary tool in their operation. So we should expect our government to use its sponsorship to aid and strengthen our colleges which have been weakened by changes in our economy.

STRANGE to relate, this is not happening. In fact, the more research the colleges do the weaker they become financially. Congress has developed a policy that research contracts should be given colleges on the basis of the so-called "dollar in, dollar out" theory. That is, the Government would only pay the actual cost of the research itself. Every business has indirect costs as well as the direct costs of labor and material, and if that business does not recover its indirect cost plus a profit, it will not long exist.

The bulk of the two billion or more being spent by the Government for research is funneled through the Department of Defense. The part of this which is farmed out to the colleges is theoretically contracted for on the dollar in, dollar out basis. An allowance is made for indirect costs as well as direct costs. The allowance, however, is seldom sufficient to repay the indirect costs of the institution. After various studies and negotiations have been completed by government personnel to determine the indirect charge allowance, it is still possible that there will be disallowances for bills rendered although the funds were actually spent in performing the contract. The total result of the negotiation is to reduce the income from the project so that very rarely does the institution recover even the money it has spent to do the work.

The agencies, other than the armed forces, seemingly vie with each other in forcing the universities to carry the greatest possible part of the cost of doing research for them. Some sponsors ask the college to share the direct cost of labor and materials. Others, such as the Atomic Energy Commission, allow direct costs and nine per cent as indirect for those projects initiated by the research institution, whereas the actual indirect cost is usually from 50 per cent to 100 per cent of direct man-hour expense. The National Institute of Health allows 8 per cent of the total expenditure, and even the National Science Foundation, which was supposed to be the saviour of the colleges, allows about 25 per cent toward indirect cost. The others have various demands, all onerous.

Through this policy, the colleges already on the road to bankruptcy, must use part of their slender resources to help defray the cost of research. The research itself may prove of great value and worth many times its cost in results obtained, but it may have a subsidiary value exceedingly more important. The research helps train graduate students on whose competence the survival of the United States may well depend.

Now, the basic policy of the dollar in and dollar out as applied to educational institutions is the height of folly. The Government should be seeking avenues through which it could aid education of all kinds. Even on the least altruistic of all bases, it is only reasonable to aid that education which is producing the product for which we have the greatest need and which is now in shortest supply. Very little investigation will convince the most skeptical that unless our scientific potential continues to exceed that of Russia, we will have no taxpayers, no Congress, and no educational institutions to starve.

Why not, in the name of common sense, pay an indirect rate of 200 per cent or 300 per cent on research contracts? This would pump a little tax money into those institutions that can return an output of trained men as well as the answers to the problems submitted to them.

SUCH a plan would favor those colleges now doing research for the Government and others that might be competent to do it. What better means could be found of locating those institutions which can do most for the long range defense of our country?

The increased cost of payment for research contracts would still amount to less than the investment in one atomic submarine, and it would be of very great help to the most useful, in a material sense, of our 1300 educational institutions.

To sum up the matter, we have moved rather abruptly from the machine age into the age of science. Since warfare is the sum of the total material power of a nation focused on destruction, we must recognize

(Continued on page 47)

Registration

(Continued from page 17)

both written and oral and approximately 84 per cent indicated that 16 hours were a sufficient length for the written examination. Of the 16 per cent who indicated that 16 hours were not desirable, the great majority favored less than 16 hours.

Group I favored registration by "eminence" by a narrow margin of 51-49. However, Group II indicated by 62 per cent voting NO, that registration should not be achieved by "eminence." Eighty-four per cent of Group I and 88 per cent of Group II indicated that in lieu of graduation from an accredited engineering school four years of responsible experience was satisfactory.

Fees

In the case of fees, 73 per cent of Group I and 77 per cent of Group II indicated their approval of the fee schedule that was included in the questionnaire.

Of those who did not approve $15 as the fee for an applicant for the P.E. license, more than 65 per cent in both groups indicated that it should be more. Seventy-one per cent of the Group I negatives and 63 per cent of the Group II negatives thought that $10 was too high for a P.E. certificate. Sixty-eight per cent of the Group I negatives and 75 per cent of the Group II negatives thought that the renewal fee should be less than $5; and 7 per cent of Group I and 8 per cent of Group II felt there should be no charge.

The suggested reciprocal registration fee of $25 was deemed too high by 95 per cent of the Group I negatives and 86 per cent of those in Group II. Seventy-seven per cent of those in Group I who voted NO to the general question of approval and 75 per cent of Group II thought less than $10 should be charged for E. I. T. license applications. For E.I.T. reciprocal registration, many thought there should be no charge.

The 1954-1955 Registration Committee feels that this survey has given valuable insight into the opinions of engineers throughout the country relative to the functioning of the registration laws. The opinions are, of course, the result of first hand experience with the existing laws, and it is hoped that this study will be an effective and useful contribution to any persons studying possible revisions of the various laws in the interest of the protection of both the public and the profession.

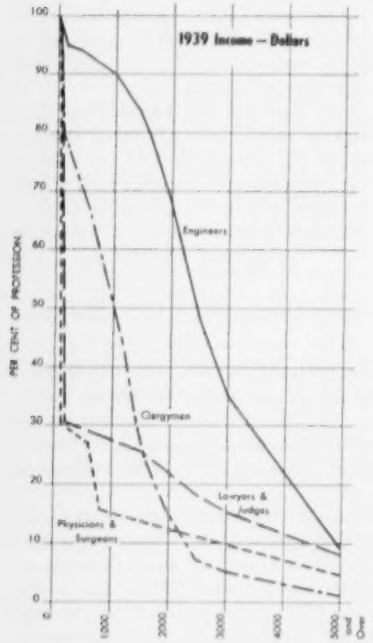
—PP—

(Continued from page 25)

ers, then even greater additions to the profession must be made. The Bureau of Labor Statistics shows that the number of workers per engineer has decreased from 250 in 1900 to slightly over 50 per engineer in 1950. It appears that our Communist opponents in the Cold War are aiming at decreasing their own ratios, so we must not let ours slip.

The report of the study of engineers in industry by the Professional Engineers Conference Board, in The AMERICAN ENGINEER for February, 1954, discussing the importance of money to the engineers states: "Answers to the other survey questions, however, lead indisputably to the conclusion that the engineer's rate of pay becomes one of the most important factors in keeping him contented, if not *the* most important, after he gets over his apprenticeship and the attendant glamor of entering a new profession."

Unfortunately, and somewhat in contradiction to the recently published salary and income surveys, the engineers, according to the income



surveys of the U. S. Bureau of Census, do not show too favorably when compared to the other professions, particularly, the three learned professions as defined in the dictionary.

Compare the chart on this page with the one on page 25. The 1949 figures show that the physicians and surgeons have far surpassed the engineers and even the lawyers are doing better. What happened to the engineers?

Any attempt to analyze this and the differences between the professions must consider first the professional solidarity of the physicians and surgeons as against the disunity of the engineers. Of the 173,000 physicians and surgeons listed by the census, 140,000, or more than 80 per cent are members of the American Medical Association.

Who's Who in Engineering lists seventy different national engineering organizations and no one of them can claim more than one-tenth of all the engineers as members. At the same time there are four engineering unions which claim about seven per cent of all the engineers for their membership.

In the July, 1951, *Survey of Current Business*, published by the Department of Commerce, a study of the incomes of lawyers and doctors indicates that slightly more than half of those included in the study, in both professions, were independents, in private practice.

On the other hand, only about 15 per cent of all the engineers are engaged in private consulting practice and the actual number of independent, self-employed engineers is considerably smaller. Among the registered professional engineers, about twenty per cent are in government service, while a salary survey of the American Society of Civil Engineers indicated that 57 per cent of the civil engineers were in some kind of public service.

In the performance of work, lawyers and doctors deal directly with the majority of persons who use their services while the engineers are mainly behind-the-scene operators and do not generally have direct professional contact with the ultimate users of their services. It is this anonymity of service that has restricted public recognition of the importance and value of engineering. The general public, the man-in-the-street, sees and recognizes the contractor as the performer of actual construction and is not always aware of the engineering which precedes that construction.

The civil engineers, the parent of all the other engineering branches, seem to be suffering most acutely in this shortage of engineering candidates and engineers. This is the branch that furnishes the largest number of engineers for public service. The salary and income surveys all indicate that engineers in public service are the lowest paid of all. This unfortunate situation has been a long standing characteristic of our American economy and is an obvious anachronism. Not only public engineers, but all public servants buy their groceries, clothing and automobiles from the same sources, and rent from the same landlords, at the same prices as do the employees of private industry.

Consider, for instance, the highway engineers. In 1950, the average annual salary of the chief engineers or chief administrators of all the forty-eight state highway departments was barely $8000. The American Management Association reports that the average annual salary for top engineering executives in companies doing $5 to $25 million in sales dollars is $14,800 and, for companies of $25 to $100 million, it is $25,250. From $100 to $500 million, the executive salary is $34,350. The annual expenditures of the state highway departments range from $8 million in Nevada to $349 million in Pennsylvania. . . .

The situation of the engineers financially, professionally and affecting the national standard of leadership in engineering technology is serious and threatening. It is a challenge to every engineer, regardless of branch or service. Any effective change must come through a strong, central, *professional* organization. Can engineers make it?—***End.***

Letters

(Continued from page 5)

Besides the ones listed is what I choose to call the "Primary Prerequisites for Success". They are: 1. The courage to back your judgment to your last buffalo nickel, and through thick or thin. 2. Salesmanship. The ability to sell a fur coat to a Fijian and a sun suit to an Eskimo. The ability to persuade President Eisenhower to vote the Democratic ticket and to sell Messrs. Dixon and Yates on the idea of endorsing TVA. 3. The knowledge of the value of the almighty dollar. Mighty few people have it today.

What Mr. Handy did not say was that the most important possession that a young man can have is character. And the most important assets that a company can have are not its secrets of atomic energy, its plant or its credit, but the number of men with character in its employ. And the greatest contribution than an executive can make is not the extra dividend but the inspiration, development and improvement of its employees who have said character. Lastly, the greatest contribution a Board of Directors can make is not a stock split but the promotion to the top of an employee who has character regardless of his experience. But how many of them do it?

It has been wisely said: "You have to hit the average executive over the head with a crow-bar to make him make a profit." That is the rule rather than the exception.

RALPH SHAW, JR., P.E.,
Beverly, N. J.

Engineering Analogies Test Is Ready

The Psychological Corporation of New York City has announced the availability of the Minnesota Engineering Analogies Test through its office.

The Test, which was developed by Dr. Marvin D. Dunnette of the Industrial Relations Center and the Department of Psychology of the University of Minnesota in cooperation with several corporations and other universities, is designed for use by universities and colleges and business, industry, and government. The educational institutions would make use of the Test in determining the qualifications of students for admission to graduate work in engineering and in counseling seniors and graduates. Business, industry, and government would use it in selecting and placing engineers and in evaluating and counseling staff members.

Defense

(*Continued from page* 45)

that our armed might is also determined by our scientific ability and that massed tanks are only a good target for one fusion bomb.

We look about and see only a small handful of able scientists who can produce the new miracles. Our enemy, apparently more concerned than we, is striving continually with smaller resources than our own to produce more scientists and engineers, and apparently is succeeding in outdistancing us.

We find that we have one source and one source only—our graduate schools, from which more scientists and engineers may be obtained.

We should realize almost with a sense of horror that we are pursuing policies in industry and government that are not only diminishing the quantity, but deteriorating the quality of their output. The raw material which our colleges receive as entrants is becoming progressively less suitable and the productive facilities of these colleges in men and material are becoming less adequate, while their leadership is suffering from financial starvation.

Perhaps it is time that we should follow the pattern of British thinking, and consider whether it would not be more logical to spend a large portion of our tax money on brains rather than on hardware which is to some degree becoming obsolete. Let us use a scientific approach in studying the problem.—***End.***

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Grad. MECHANICAL Engr. For Mgf. Design Engr. Several men needed to perform manufacturing process engr. functions of yokes, high voltage transformers and ferrite cores. (59-S-13)

STRUCTURAL Engr. 1-5 yrs. exp. in structural design and detailing. Cold formed structural exp. rather than hot formed Design of Industrial buildings helpful. (101-S-13)

DESIGN Engrs. Central Illinois. Earthmoving Equip. Manufacturer. Openings in Product Design Dept. for exp. designers of prime movers and/or hauling units such as scrapers, cranes and buggies. Excellent employee benefits and advancement opportunities; Salary depends upon ability. (163-S-1)

Positions Wanted

Reg. INDUSTRIAL Engr. — Grad. MECHANICAL Age 42. Courses after graduation in industrial management and engineering. Heavy exp. in Estimating, Production & Industrial Engineering. Over 8 years exp. at staff level in industrial and manufacturing engr. Desires position commensurate with ability and training with reputable company. (A-27)

Reg. INDUSTRIAL Engr. Age 30. 6 yrs. Industrial engr. exp. including Inspector of Diesel engines, time study with Rubber Industry; Manager of Standards dept. of Paper Company. Interested in systems or Methods. (A-183)

Grad. Reg. ELECTRICAL Engr. Age 41. Exp. in designing and devel. home appliances with emphasis on high volume production. Class A design engr. in laundry equipment. $10,000 Salary range. (A-331)

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...NEW LITERATURE...

To help the offering firms determine which literature you require, when requesting an item, be sure to list all specifications shown . . . and say you saw it in the AMERICAN ENGINEER.

INDUSTRIAL HEATING—A new handbook designed to provide plant management and engineers with basic concepts of industrial heat processing and heat control is now being distributed by the Michigan Oven Company of Detroit. Heat to fuel cost comparisons to design elements are discussed. Regardless of the type of heat processing used the "Fact Book" is said to be a "refresher" course in process heating. The major consideration in modern oven construction, oven heat control, design objectives, etc., are among recent process heating developments. Common formulas used in calculating heat and oven requirements are also included. For your copy of the MOCO "Fact Book" write: Michigan Oven Company, 415 Brainard, Detroit 1, Mich.

—AE—

NETWORK PROTECTORS—"Network Protectors for A-C Secondary Network Systems" is the title of a new General Electric bulletin just published. Designated GEA-2017E, the 28-page bulletin covers all phases of A-C secondary networks. Illustrations include numerous diagrams, charts, and photos of the units and their components, with detailed description of their operation. Also discussions of fuses and relays in network protectors. Complete specifications of all types are included. Requests for the bulletin should be addressed to General Electric Company, Schenectady 5, New York.

—AE—

LUBRICATED PLUG VALVE—Homestead Valve Manufacturing Co. announces Reference Book 39-5 showing a new lubricated plug valve for 200 pounds oil-water-gas, or 150 pounds steam working pressure. Features positive high pressure distribution of lubricant over the entire sealing surface; a self-freeing plug to prevent sticking; and ease of operation of a cylindrical plug valve. The new valve is available in straight-way, 3-way, 4-way and multiple port types with either 100% pipe area or venturi (restricted flow); and cast in a variety of metals and alloys including semi-steel, steel, brass, aluminum and ni-resist. Reference Book 39-5 showing the complete line of these new valves will be sent upon request to Homestead Valve Mfg. Co., Valve Div., Coraopolis, Pa.

—AE—

PHOTOCOPY PAPER—Sensi-Trol 56 is a newly developed equalizing ingredient said to scientifically balance and control variances in light, temperature and other operating conditions to make photocopying easier, faster and surer with any type photocopying equipment. The American Photocopy Equipment Company (APECO), whose laboratories developed Sensi-Trol 56 photocopy papers, contend that they meet the practical demands of business with no quality dissipation from heat or filing. The free folder offered by Apeco outlines their quality, what types of businesses are using them, and what they are profitably copying with them. For your copy, write the American Photocopy Equipment Company, Adv. Dept., 1920 W. Peterson Ave., Chicago 26, Illinois.

TOOL & DIE BROCHURE—Cleveland Tool and Die Co. announces the availability of a new 38-page brochure. Produced in full color, profusely illustrated, the brochure covers such subjects as Custom, Standard and Special Purpose Lamination Dies; various phases of Tungsten Carbide fabrication; Compacting Dies for metal and ceramic operations; Jigs and Fixtures; Precision Gages; Custom Jig Grinding and Boring; Precision Testing Equipment; Special Purpose Equipment. Copies of the brochure may be obtained by writing direct to George Banko, Cleveland Tool & Die Co., 1643 Eddy Road, Cleveland 12, Ohio.

CORROSION CONTROL—"How Zinc Controls Corrosion," a new 32 page illustrated booklet has just been published by the American Zinc Institute. Describes the many ways zinc lengthens the life of steel products, and reduces maintenance costs. Drawings, charts, and photographs together with brief comments present the corrosion control characteristics of zinc coatings, zinc pigments, and zinc anodes. An extensive selection of building, farm, industrial and marine applications of zinc is reviewed. A copy of the booklet may be obtained without charge, from the American Zinc Institute, Inc., 6 East 42nd Street, New York 17, N. Y.

—AE—

SOIL-CEMENT STABILIZATION — "The ABC's of Soil-Cement Stabilization," a new 36-page brochure offered by Pettibone Wood Mfg. Co. presents a comprehensive, detailed story of how this material is being used as a low-cost base course in the construction of roads, streets, airports and parking lots. Covers kind of soils that can be used, how soil-cement stands up, how fast it can be laid, what size jobs it can be used on and how it is processed. Points out advantages of rebuilding existing roads and shoulders by salvaging asphaltic materials already in place and stabilizing them in cement. Operational diagrams show four different recommended procedures to lay up to three adjacent windrows on various job applications. Series of reference charts outline tabular data on the proper use of soil-cement under varying conditions. Copies of the brochure are available without charge to requests written on business letterheads to Pettibone Wood Mfg. Co., 6900 Tujunga Ave., North Hollywood, Calif.

GEAR MAKING—A portrayal of gear making, with many close-up photographic views of operations reproduced in multicolor, is presented in a new 44-page brochure by the Sier-Bath Gear & Pump Co., Inc. Illustrates the principal types of gears and miscellaneous combinations, picturizes and describes the most modern methods and techniques of gear testing for extreme accuracies, and explains the newest trends in gearometry. Numerous engineering graphs and tables, embodied in a Gear Design Formula, are a valuable reference. Approximately 100 photos, graphs, tables and technical views are shown. Subjects covered in the brochure include: Simple physics of gear movement; comparative action of gears having same pitch diameter; load errors costly to gear life; remedy for gear errors; methods of recording and charting gear accuracies; microscopic observation of case depth; magnetic detection of gear defects; copper plating of gears to prevent carburizing leaks; heat treating techniques for high and low carbon steels. "Gears of Integrity," from Sier-Bath Gear & Pump Co., Inc., 9252 Hudson Boulevard, North Bergen, N. J.

—AE—

CONCRETE PILES—Raymond Concrete Pile Company, international foundation and heavy construction firm, has released a brochure entitled "50 Years Abroad with Raymond," illustrating types of construction projects it has completed in other countries. Typical examples of construction are pictured, including ports and harbors, piers, seawalls, and other waterfront work; highways, bridges, tunnels, airports and dams. Among buildings shown are power plants, hospitals, refineries, industrial buildings and large-scale housing development. Request from Raymond Concrete Pile Company, 140 Cedar Street, New York 6, N. Y.

—AE—

STEEL DICTIONARY—A 32-page dictionary of steel terms of value to men who buy or use cold finished steel bars is available from the LaSalle Steel Co. Entitled "Simplified Steel Terms and Engineering Data", it includes more than 180 relatively detailed definitions frequently used in the purchase, manufacture, treating, machining and finishing of steel. Terms defined range from Annealing and Austempering through Isothermal. Quenching and Macro-Etching to Spheroidizing, Stress Relieving and Yield Strength. Copies are available without charge from LaSalle Steel Company, Chicago 80, Ill.

—AE—

ELECTRONIC FLOW METERS—The Hays Corp. announces their new booklet entitled, Hays Electronic Flow Meters, for measurement of differential pressures; liquid level; fluid, gas, air or steam flow; temperatures and pressures. Features six counter continuous integration, 12 inch uniformly graduated charts and choice of several style indicators. Combination of flows or flow and level can be recorded on same chart. Over pressure protection in either direction. Write for Publication 55-174-222 to The Hays Corporation, Michigan City, Indiana.

Iowa Case

(*Continued from page 35*)

terurban railroad — "A substantial portion of the freight hauled by the railroad is moving in interstate commerce;" plans and specifications for installation of equipment in the municipal power plant of a town in Iowa— "The power plant supplies electricity to various enterprises which ship a substantial portion of their products outside of the state;" plans and specifications for new headquarters buildings for three rural electrification cooperatives "which distribute electrical energy to railroads hauling interstate freight and passengers; to factories producing goods for interstate commerce; to telephone networks and radio stations for interstate messages and programs; and to a state highway patrol for communications controlling interstate traffic."

After noting the statement of the Supreme Court in a previous case, "to search for a dependable touchstone by which to determine whether the employees are 'engaged in commerce or in the production of goods for commerce' is as rewarding as an attempt to square the circle," the Appeals Court reviewed a series of guiding principles to be applied in determining coverage, as announced in previous cases.

The decision placed considerable emphasis on the function of the resident engineer, particularly with respect to the street paving work, stating, "the inference is fairly deducible that the work of the 'resident engineer' was a vital factor affecting the progress of the construction project. . . . completion of a project depends in no small way upon the services rendered by defendant's (consulting engineer) employees." *** To hold that the 'resident engineer' exercises no control of the work of the contractor and does not perform a vital function in the total activities of a construction project, is to turn away from the realities and practical considerations of the situation and be guided by technical conceptions, contrary to the teaching of the Supreme Court . . ."

The court concluded that ". . . defendant's employees' preparation of plans and specifications for the repair and improvement of existing instrumentalities of commerce, together with the activities of the 'resident engineer' at the actual job site, were sufficient to bring them within the coverage of the 'in commerce' phrase of the Fair Labor Standards (wage-hour) Act."

The decision said that in giving the wage-hour law "the liberal interpretation required, we are convinced that the stipulated facts in this case demand a holding that the employees were engaged 'in commerce' and that the trial court's conclusion to the contrary was erroneous."

Whether any of the employees of the Brown Engineering Company were 'professional' employees and thus exempt from the wage and hour requirements of the law was not discussed in the opinion. It is not known whether the consulting engineer will appeal the decision to the Supreme Court. The decision of the Court of Appeals is not binding on other circuits, but it is an influential expression of opinion and may have a material bearing on future decisions in other parts of the country. If an appeal is taken to the Supreme Court a decision could not be rendered before next year.

Need Help with an unfamiliar engineering problem?

Consult a specialist. Look in the Professional Directory, pages 38-41.

Appraisal Manual Ready

The American Society of Appraisers has announced the availability of its new Appraisal and Valuation Manual.

The volume of nearly 500 pages is the result of a two-year survey of the Society's membership; and the contents cover a wide range of topics related to every phase of valuation and appraisal in all branches of architecture, building construction, public works, and engineering.

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What's New

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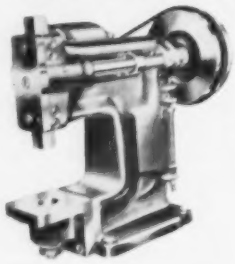
POWER BENCH TYPE PUNCH PRESS — Item 1



Specially designed for small, important, often difficult work, the new Model LTX Power Bench Type Punch Press, manufactured by Alva F. Allen Industries is made specifically for Slotting, Cutting, Pinking, Scoring, Marking, Embossing, Perforating, Creasing, Punching, etc., material such as Leather, Plastics, Textile, Paper, Fibre, Metal, etc. Ideal for Experimental Purposes. Leaves your heavier machines free for larger dies. Will mass produce with a capacity up to 250 operations per minute of continuous operation. Requires only 1/3 H. P. Motor and has direct V-Belt drive.

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METAL FILLER COMPOUND AND THINNER — Item 2

Destiny Products Co. announces an aluminum based, putty-type metal filler compound, "destiMETAL." Also a companion product said to be an unusual thinner and solvent called "destinSOL." Compound is a metal alloy in plastic form which can be applied without heat, as a filler, to other metals, wood, plastics, fibre glass, and plaster. In its straight form, it is used as a permanent metal-filler for cracks or holes in castings, extrusions, stampings and forgings and for the repair of patterns, molds, dies, models, match-plates, and valves. Can be drilled, milled, tapped, sanded, filed, ground, and generally worked as any other metal alloy. When thinned, compound can be sprayed on surfaces as a coating.

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PORTABLE COMPRESSION TESTER — Item 3

A new lightweight compression tester that enables compression and crushing tests to be made quickly and easily is being offered by Soiltest, Inc. This low-cost, lightweight portable hydraulic compression machine has been used with excellent results on metals, ceramics, wood and plastic parts; paper boxes and other containers; soils, building and highway materials; and springs and similar items. It can be employed on inspection lines and in industrial laboratories. It is an adaptation to industrial use of the apparatus widely used in soil testing.

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SAVES TIME ON DRAWINGS — Item 4

Sketch-Easy is a new time saving drawing method adapted to in-plant training. Developed recently by California Visual Aids Company, it is available to industry through a program conducted by Technical Service, Division of Northrop Aeronautical Institute, Inc. The kit is used to enable the personnel in training to acquire practice in laying out quick three dimensional idea and shop fabrication sketches. The technique achieved through Sketch-Easy training is said to be particularly beneficial to engineers, draftsmen and others concerned with the need to originate and transmit technical information and ideas in a fast and accurate fashion.

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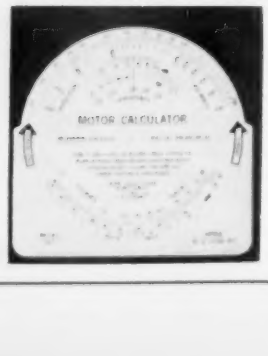
MOTOR CALCULATOR — Item 5



A single setting of a new time saving, direct reading Motor Calculator is said to replace seven operations with a conventional slide rule. Setting for any relationship of Speed vs. Torque, gives Equivalent Watts Output and Horsepower in decimal and common fractions, also the Percent Efficiency for any value of Watts Input. Motor Calculator makes it possible to visualize the relationships between values and where alternative operating values are possible the best engineering compromise can be selected by inspection thereby saving time. Printed on vinylite in 6½" width with 7" cycles.

This column describes new products of general interest to professional engineers. For further information, fill in the coupon provided and mail to the AMERICAN ENGINEER.

DRAFT-A-MATIC DRAFTING DESK — Item 6

The General Fireproofing Company recently announced a new drafting desk—the Draft-A-Matic. Drafting platform is equipped with a patented endless vinyl plastic belt 48" wide. Can accommodate a drawing 72" long. Belt is wrinkle-free, provides an ideal drawing surface and features a self-healing characteristic which is said to prevent pencil grooves and compass point holes. The belt is moved by two anodized aluminum rollers: one at the back and the other at the front of the drafting platform. By merely turning the wheel at either end of the front roller, the belt moves the drawing.

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FHP MOTOR FOR MACHINE TOOLING — Item 7

A totally enclosed fractional horsepower motor, especially designed for use on machine tools, has been announced by General Electric Company's General Purpose Component Motor Department. The new heavy duty motor is factory lubricated for ten years' service under normal machine tool conditions, according to G-E engineers, by a special motor grease which is highly resistant to oxidation and moisture. Ideally suited to plugging service and dirty atmospheres, the motor is totally enclosed and fan cooled. Built to meet the demands for frequent start-stop service, the motor has normal torque for starting, high pull-up torque for inertia loads, and high breakdown torque for peak loads.

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CONVEYOR BELT SLIDE RULES — Item 8

Two slide rules, a horsepower calculator and carcass, or belt fabric selector, are said to cut the time needed to design a conveyor belt installation from three hours to ten minutes. Five settings on the horsepower calculator will give the horsepower needed for 98 per cent of conveyor belting systems. Seven settings will yield the drives for level, incline or decline, manually operated tripper and self-tripper systems. Carcass selector will pick the right belt fabric as well as correct number of plies for proper troughing, and minimum pulley diameters for the entire system—take-up, drive, tripper, etc.

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25-YEAR NUCLEAR BATTERY — Item 9

A nuclear battery that converts nuclear energy into electrical energy has been developed by the Patterson-Moos Research Division of the Universal Winding Company. Capable of performing reliably under temperature conditions ranging from minus 60° F. to plus 160° F., the battery has an operating life in excess of 25 years. Three models are available with voltage and current ratings ranging from 1-10,000 volts and 5-2,000 micromicroamperes. The disintegration of Strontium 90 is used as the energy source; and the company states the external radiation of the battery is within the Atomic Energy Commission tolerance limits.

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SPLICE CAP INSULATOR — Item 10

The new Buchanan Nylon Splice-Cap Insulator features extreme ease, speed and simplicity of installation and provides excellent electrical and mechanical protection to spliced joints. Exclusive "snap-on-lock" design is said to assure factory perfect insulation of wire splices. Eliminates threading, wrapping or twisting of insulator during installation. "One-piece" nylon construction with internal metallic retainer ring allows the insulator to be quickly snapped in place over installed splice cap, yet prevents its accidental removal in service.

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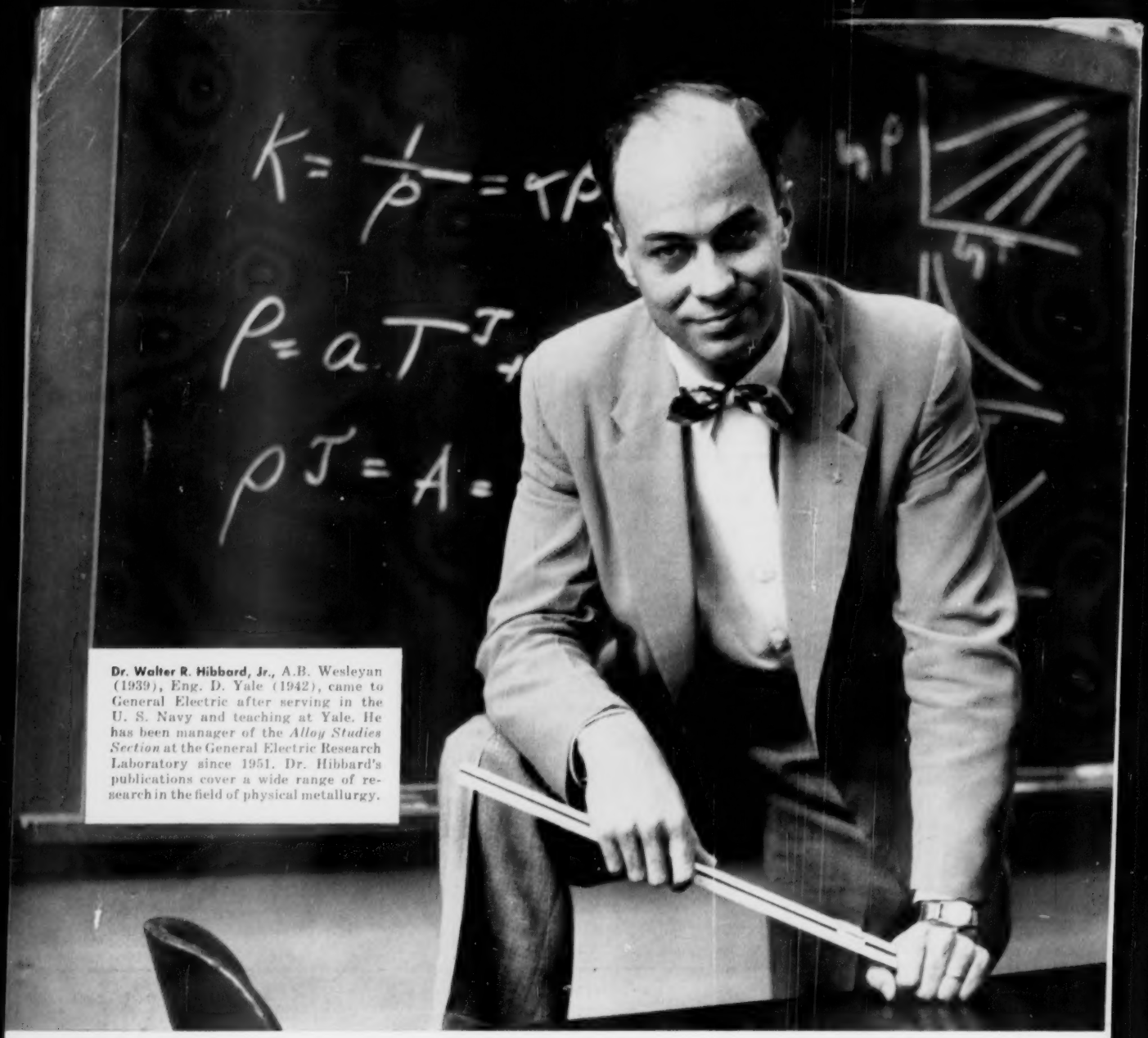

Dr. Walter R. Hibbard, Jr., A.B. Wesleyan (1939), Eng. D. Yale (1942), came to General Electric after serving in the U. S. Navy and teaching at Yale. He has been manager of the *Alloy Studies Section* at the General Electric Research Laboratory since 1951. Dr. Hibbard's publications cover a wide range of research in the field of physical metallurgy.

New alloys for special uses

General Electric's Dr. Walter R. Hibbard, Jr. clarifies relationships between structure and properties

Recently the G-E Research Laboratory was asked to design an alloy to be used in a new type of heating element. In addition to good formability, the alloy had to have a special temperature-resistivity curve not available in any commercial material. Dr. Walter R. Hibbard, Jr., after less than an hour with pencil and paper, came up with the answer — a new composition and detailed processing instructions.

Dr. Hibbard's success was dramatic evidence of how metallurgy has progressed from an industrial art to a science. Until the last few years, new alloys with prescribed physical, electrical or mechanical properties had to be developed primarily by trial-and-error "cookbook" methods. Dr. Hibbard and his associates, through their basic studies of atomic arrangement in metals, are shedding new light on the relationships between the *structure* of alloys and their *properties*. This General Electric research will play an important role in the many areas of our technology where future progress is dependent on improved materials.

Progress Is Our Most Important Product

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